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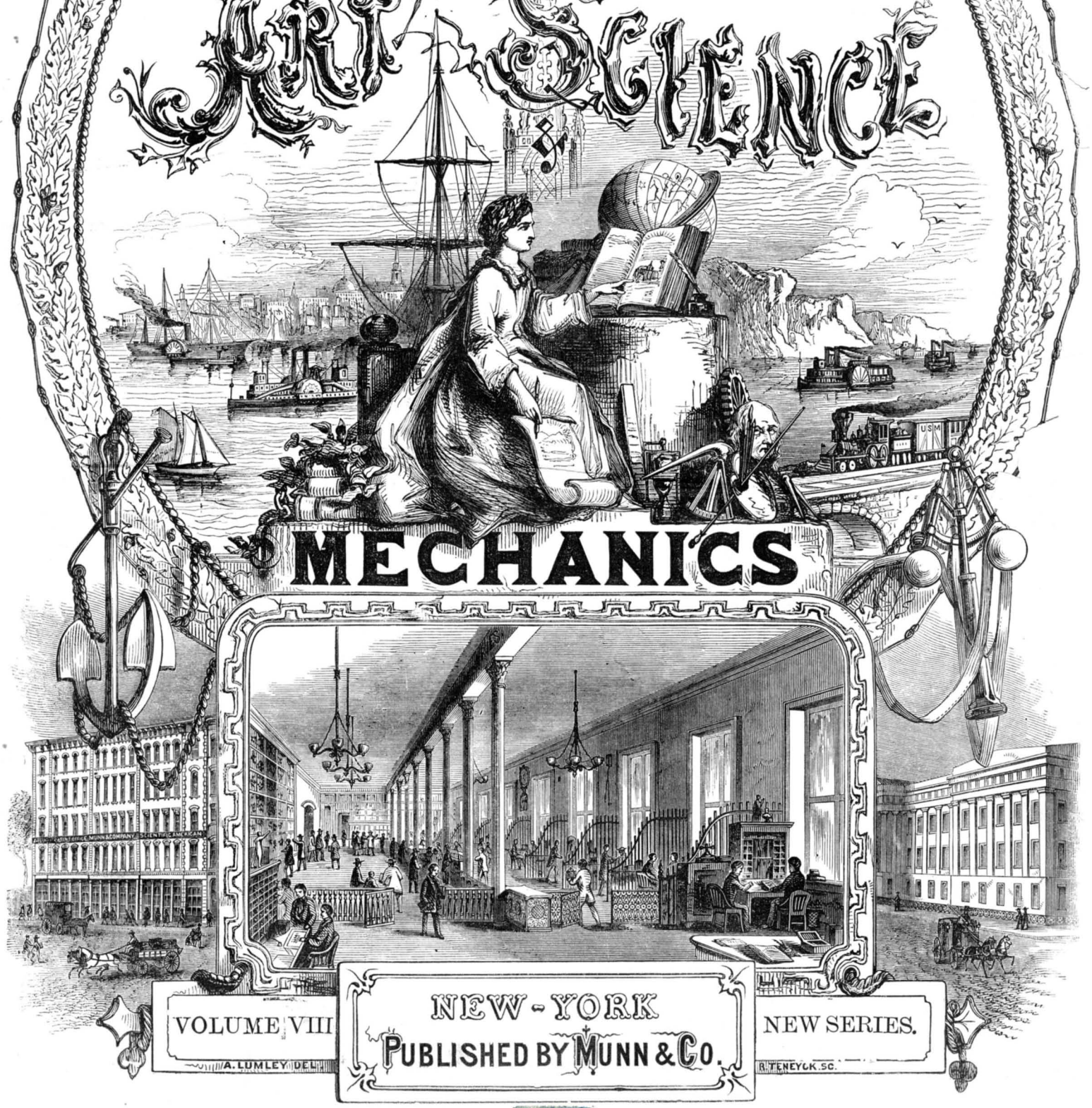

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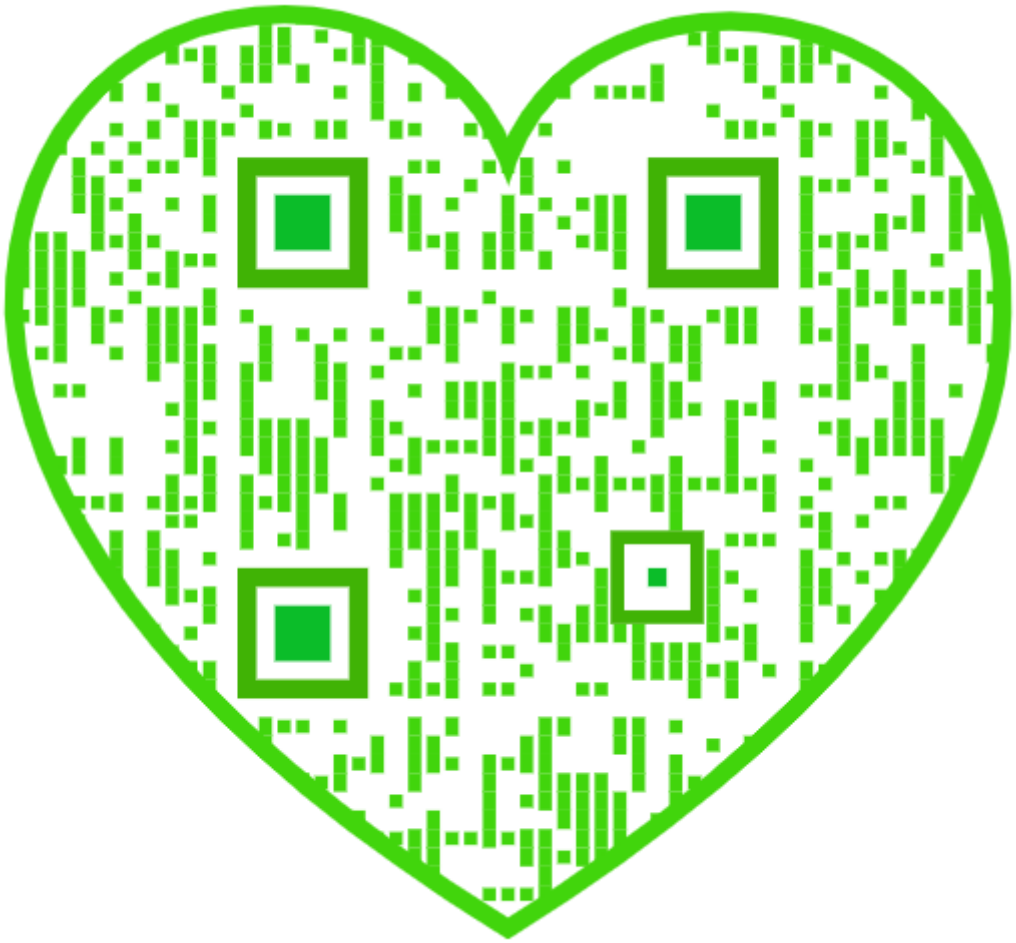

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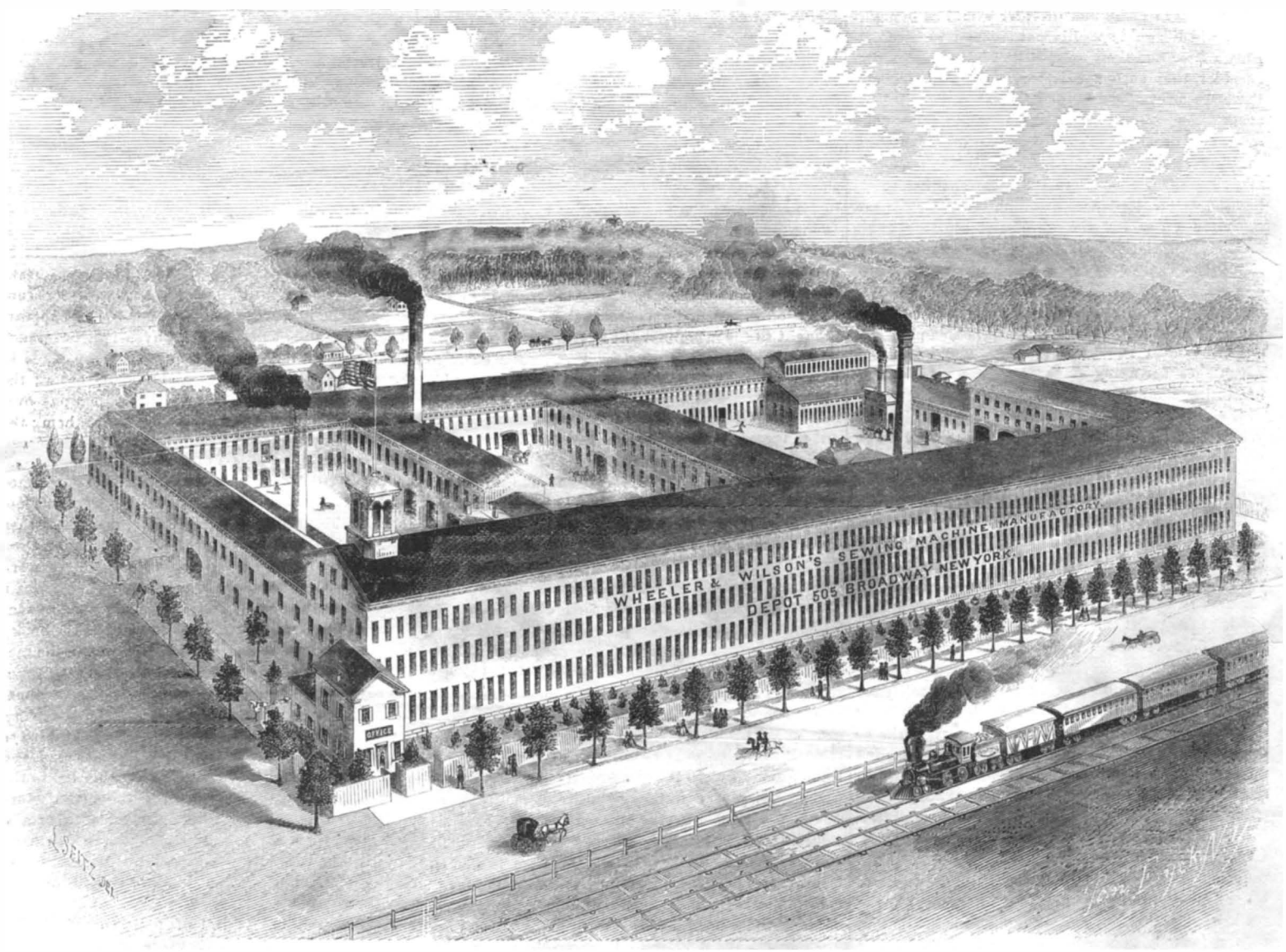

WHEELER AND WILSON'S SEWING MACHINE MANUFACTORY.

The Wheeler and Wilson Sewing Machine—A Model Workshop.

The great inventions of modern times may be briefly enumerated. They are the steam engine, the electric telegraph, and the sewing machine. Others of great importance have been introduced, but we refer to these three, as those which have, to a great extent, revolutioned our social institutions. Certainly none can have a higher standing, in this respect, than the last one upon the list. While the others have created for themselves a fame and history which shines brilliantly among the mechanical achievements of the age, neither of them come so close to the common interests of both sexes as that machine which has signally triumphed over obstacles and prejudices which seemed insurmountable.

So great has been its popularity, that, in order to meet the demand for it, immense factories have been erected in different parts of the country. The feeling in favor of particular machines is perhaps something incomprehensible, when the general excellence of one is apparent to all. The industrial associations throughout the United States, as well as the jurors at the great International Exhibition lately held at London, have declared almost unanimously in favor of the Wheeler and Wilson pattern. Its merits, as a machine for general work, are so palpable to those who are familiar with it, as to need no praise at our hands; lightness, ease of action, simplicity of design, thoroughness in construction, non-liability to derangement, these are the great essentials in a sewing machine, and these qualities are all combined in the one which we shall make the subject of our article. We were in East Bridgeport a few days since, where the Wheeler and Wilson Company have their factory, and thinking that a few hours could not be more profitably employed than in looking through it, we made known our desire at the office, when the President, Mr. Wheeler, at once afforded us every facility.

Let us, however, premise before going further, that the Company have no secrets in the construction of their sewing machine. To any one who is desirous of witnessing their tools and workshops, the doors are open and permission accorded to view everything and every branch of the business, from beginning to end. From Alpha to Omega, nothing is concealed; a frank and liberal spirit which it would be well for the manufacturing community at large to imitate. Let us, also, entreat the sometime visitor who shall come after us, to remark the order and discipline which prevails on every hand. After this brief diversion, with Mr. Superintendent Perry, we enter the factory. Stepping across an ante-room from his office, he opens a door, and at once, a long vista of busy machines and their attendants is disclosed; five hundred and twenty-six feet in length, and thirty-six feet in width, are occupied on the ground floor by a system of machinery which seems to act with almost human facility and discrimination. Here the heavier parts of the sewing machine are prepared for the other fittings. In order to have a clear idea of the plan pursued throughout the establishment, it will be necessary to inform the reader that all the materials and tools are furnished by the Company, and the work is executed for them by contractors or jobbers. To each of these jobbers, a certain part of the work is assigned, one man taking the beds or solid frame of the machine, the frogs, as that part is called which carries the cloth presser, and the needle arm. Another man will make the

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ıe piece which goes between the
vibrating arm, the slide rings,
ıds the bobbin or spool up to the
nd any other divisions of the sewing
nich his experience or natural skill has
he Company will be well executed in his
Thus all the details are parcelled out among
veral contractors.

ow, be it borne in mind, the Wheeler and Wilson
ne is not made from hand to hand, as the
ying is, but from its inception to the last nail driven in the packing box which carries it to its final destination, every operation performed is but one of many, tending toward completion, that belongs to the mechanical system employed in the manufactory to insure absolute fidelity in every particular. It is easy to see that, if every jobber executed his work as best suited him, and according to his own ideas of what was required in the premises, a grand era of chaos and disorder would be inaugurated, which would speedily put an end to the Company's fame and the good quality of their machines. In order that such a catastrophe may be avoided, there are a set of gages, or duplicates, provided for every screw, spring, or bar, employed in the sewing machine; these gages are supplied to the various contractors, and are made from originals in the possession of the Company, to which no one has access but the superintendent. For each piece there is not only one gage, but there are also separate gages for every variation and curve existing in those shapes; so that every radius and every angle is precisely similar in each individual machine. It is not necessary to have a professional education in order to appreciate the benefits arising from this plan, but our mechanical readers will readily understand the advantages springing from it. We wish the manufacturing community at large could have one glance at the beautifully made and kept gages which the Wheeler and Wilson Company uses; our word for it, no one, who has a regular and stipulated pattern of an invention to make the year round, would ever be without similar devices.

Not only are these tests kept for the purpose of insuring accuracy in the forms of the working parts, but fac-similes are also made of all the screws, from the largest to the smallest; in their bodies, in their threads, and lastly, in the distance from under the head, to the point where the rounded top meets the sides. Since all the holes are drilled to just such a depth, as a matter of course, every screw must be of a standard length and size, and we can readily see how by conforming to the rules made for the guidance of the contractors, the whole factory works as one brain. Part after part goes through the required operations, never coming back from one machine to another, but entering at one end of the room, and so going the round of all the tools in the various stories, being finally carried into the inspecting rooms. Here they are put together, tested, run and approved. Indeed to such lengths is the principle of order and regularity carried, that after leaving the workshops, the visitor feels an irresistible inclination to step exactly square and true, and to otherwise conform to habits of regularity and method. Thus it will be seen that these factories have also a vast moral influence which must be felt to be appreciated.

Let us after this necessary introduction, look at the planing machine, on which the bottoms of the beds or frames are being faced; this being the starting point to which all subsequent parts are accessories, and the other operations subordinate, it is a very simple performance, and is only mentioned as a base of operations. After the bottom is faced, the bed is then removed to another machine, called in mechanical parlance, a miller or "slabber," this cuts out the recess for the feed-bar and trues the plate faces. The rib that receives the foot of the cloth presser or frog, and the squared faces at the back, are done upon another similar machine. Thus having secured two planes at right angles with each other, everything else is done with reference to them. As for instance, the several holes with which the sewing machine is pierced for shafts or screws; these are all in a line with some one of the other planes or faces, there is no obliquity or divergence from a right angle, unless such a feature is required in the machine.

The holes are drilled by what are called gang drills, that is, one drill for as many holes as are required, all running in the same frame and revolving together. The bed is then placed in a "jig;" this is an apparatus which is furnished with projections that touch all the working faces in the sewing machine bed. The holes to be drilled are laid off in this jig, and bushed with hardened steel thimbles, so that their positions remain always the same. Supposing the plate of the drill press to be perfectly square, or at right angles with the tool, and the surfaces of the "jig" bearing upon it, also correct, the holes which are pierced by following those laid out in the pattern, are always true, and each machine in this particular is a fac-simile of the others. To see that the "jig" is always in a proper condition in the business of the contractor, for upon it depends the fidelity of his work.

Having thus seen the process employed in this one particular, we will not detail the others at great length. To do so would require a vastly greater space than that comprised in a newspaper article; follow us on down the shop, which is closely stowed with every conceivable variety of tool—some, indeed, inconceivable in their dexterity and ingenious working. Of the latter is the machine which makes the rotating hook, one of the most beautiful pieces of mechanism that it is possible to imagine. The hook and shaft are made out of a steel rod but very little larger in diameter than the finished piece; it is first cut off about seven or eight inches long, then heated in a furnace and placed under a drop press, which has dies in either face corresponding to the shape desired. Four distinct dies are necessary to bring it to the rough form. It is then annealed or softened and brought to the machinist, who performs all the work needful to complete it—such as turning the shaft to fit accurately, turning the hook part, which is, in this stage, nothing but a round button like a flattened pill box—placing the shaft in the lathe and cutting out the recess in front where the bobbin rotates—sawing down behind the face so as to form the clearance required—shaping the cast-off, and, in short, executing the multifarious details which must be completed before it is perfect. In all of these operations the machinist has little else to do than superintend the lathe or tool that does the work. From the soft steel, gray, cheese-like parings come away until the whole piece is of the required dimensions. So we follow through the shop, and see first one part and then another, brought into contact with the rapid noiseless cutter, until we have traveled nearly the entire length. We stop for a moment to look in at the two steam engines of eighty-five horse power, also built in Bridgeport, which drive the works, and remark the admirable cleanliness and order visible there; also to view the wash-rooms where the mechanics have every facility requisite to make themselves presentable to the outer world, though one would hardly think it necessary, so neat, intelligent and respectable do they look. We then hasten to follow our chaperon, Mr. Perry, to the second floor.

Here the smaller, and consequently lighter, parts of the sewing machine are fabricated, and we look upon operations similar to those we have just left. Ascending once more we find, in the third story, the several appliances which belong to the sewing machine in various stages of construction; these are the needles, spools, hemmers, and other extra appliances, the invention of which has greatly increased the machine's utility.

The needles deserve more than a passing notice; few persons have an accurate conception of the labor and time expended upon them. One, taken in the hand, is a slightly curved steel wire with a round body and a sharp point, whose eye is near the end; but to reduce it to this form, out of a piece of stock, requires much ingenuity. After the wire is softened, being previously cut to the right length, it is turned in a lathe to nearly its proper shape; the groove must then be formed in one side. For this purpose a pair of steel dies are made having grooves in them the size of the intended needle; in the center of this groove is a raised edge or rib, running along as far as it is desirable to carry the recess to be made in the former. The thickness of the rib varies in the standard of the implements made; in the 0 number, for instance, which is the finest size, the groove is not much wider than the column rules of this journal. When we reflect that an eye or hole for the thread has to be drilled in this needle, and the groove polished, we are naturally astonished, nevertheless it is done. By means of a fine thread, the size with which the needle is to be used, and some flour emery, or its equivalent, the eye is polished and left perfectly smooth. To make perfect needles much skill and care is necessary. Mr. Perry informed us that he frequently received proposals from abroad from parties desiring to furnish the company with this branch of their manufacture, stating, as an inducement, that they could make them much cheaper. Unfortunately, however, for the proposers in one instance, the sample sent was very much poorer in quality than the worst ones thrown away weekly by the company. And we might cite many other instances which would support the value of the system insisted upon by the company, that is—absolute accuracy in construction.

In one of the lower shops we were shown a hook shaft which had a slight scratch in it, made by the turning tool; its value was not impaired in any way—it would work perfectly, but yet it was, we were informed, likely to be condemned, because, as our guide remarked, to allow it to pass unnoticed would be a departure from established rules, for which there was no precedent, and to which infraction no bounds could be set. Here lies the secret of the success of the Wheeler & Wilson sewing machine; for as all parts are interchangeable, being exact duplicates, the one of the other, entire uniformity throughout is attained.

The growing length of our article warns us to be brief. We must pass through this department hastily, only glancing at the bobbin or spool that runs between the hook and slide ring; this is, in appearance, the simplest part of the invention, but much depends upon its construction. They are made in three pieces, the two sides and a brass center; the sides are stamped out of a tin sheet, then put over the brass center, and that closed up on to them; the spool is then apparently done, but it must be placed in the lathe, turned to an exact size at its edges, and to a specified shape on its sides. Mr. Perry informed us that at one time great difficulties were encountered in the working of their sewing machines, they would go very well for a time, but on resuming operations, after ceasing a while, no satisfactory work could be done. This, as it may be supposed, was a source of much anxiety to the Company, and our informant stated that the trouble was laid to the hook; that whenever anything was out of order in the machine, *that* part always took the burthen of the blame. Finally, however, he took a machine home and puzzled over the cause of its mal-operation for some time, until he at length discovered that by always putting the bobbin with the same face toward the hook it ran perfectly well. This trouble led to the invention of special machinery for the manufacture of this part, and no further inconvenience of any kind is experienced.

With this little interpolation, let us leave the machine shops and all their attractions behind, and enter other apartments. If we look in at this large room we shall find it full of polished and finely-executed cabinet-work. These are the cases which adorn and protect the new household god that now sits upon nearly every hearthstone in the land. We remark how the tables are put together in sections, so that they shall not check or spring, each one being made of five thin pieces laid one upon top of the other and then glued fast. Let us pass the packing room and the japanners at their labors, and go to the "tuners" or inspection rooms. This branch of the sewing-machine business comprises the accurate and final adjustment of the several details which have passed through other hands. Unto these men is given the authority to reject any and every portion of the work that does not agree with the gages; for these latter tools are brought into requisition again for the we-do-not-know how-many hundredth time. Arbitrary accuracy is insisted upon, and the unlucky jobber or workman, whose labor is thrown out, must bear the expense of it himself. After the machines are all adjusted, they are then put on a long table, and run for two hours, by belts attached to the shafting overhead, so that all their working parts may have the little asperities which still exist in them, smoothed off. They are then handed in to a mysterious-looking apartment, closely walled in on all sides, having the announcement "No admittance"

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staring us in the face; by reason of the presence of the superintendent, however, we march into this *sanctum* and see the practical operations there. The workmen alone are excluded from this room; visitors accompanied by the authorities are at all times allowed access to it, as they are to all the other departments within the building.

It will be palpable to any one that this department requires much experience with the subject, and great business integrity, for into the hands of these two men are committed the reputation, in a great degree, of the Company's manufacture. No matter how well made they may be, primarily, if the adjustment is bad the machine is unsatisfactory in its operation. The machines are sewed with and tested in every way to prove them, and if they fail in any one particular, the inspector opens a little door in his apartment and thrusts the machine out with its fault affixed to it written on paper. No words pass on either side, and the affair seems quite an inquisitorial process. If every part works harmoniously, the piece of cloth that was used in trying the machine by sewing, is left on the plate with the thread still through it, both above and below, remaining in the needle. This prevents any suspicion on the part of purchasers that the piece was ingeniously manufactured for business purposes and then attached to the Wheeler and Wilson machine. It is almost superogatory to say in concluding this division of our article, that none but the best materials are used. The steel for the hook and shaft (it being all in one piece) is English, the cast iron is American, and the wrought iron is also native, from Ulster county, one of the finest brands in the world for tenacity and integrity of fiber.

It is with much regret that we pass, with only a slight mention, the several branches of decorating the machine, of silver-plating, and the foundry and blacksmith departments. In the artist's rooms we saw several machines most beautifully finished in gold and pearl, and indeed, in all the different trades and operations carried on within the workshop, such as cabinet-making, the foundry, the japaners, finishers, decorators, blacksmiths, adjusters and needle makers, matters of new and striking interest presented themselves. It is only left us in concluding our article, to remark upon some of the most noticeable features of this vast manufactory. These are the cleanliness, order, and good discipline which prevail, and also the system of gages, and the thoroughness and utter fidelity throughout of the different attachments of the sewing machine with relation to each other. Such a complete and perfect principle of accuracy as the gages used secure to the Company has never fallen under our notice before. We have seen many shops where perfection was supposed to be the rule, but it was so far from being the case that any irresponsible person altered the drills, or rimers, as best suited his own sovereign pleasure. Of course, where such departure from established rules occur, the routine once broken is never re-established. The perfect good feeling and mutual respect co-existing between the superintendent and the employes, was not the least agreeable part of our visit. And for one we can bear witness to gentlemanly qualities on the part of our guide, to whose modesty we hope we shall not do violence, if we mention his "initials"—Mr. Perry.

It is remarkable also, to see a machine shop where no files are used; we mean by this, none in comparison to what are generally consumed. The various tools do all the work without further finishing, except such as is given to them by emery wheels and the operations. Those who have seen Messrs. Wheeler and Wilson's invention need not be told how beautiful that is. Near the factory is a beautiful brick engine-house which shelters a fine steam fire-engine, called the "Seamstress," one of the handsomest pieces of workmanship we have ever seen, belonging to the Company and manned by its employes. A brass band and drum corps, recruited from the 320 men in the Works, discourses music of an excellent quality.

We leave the factory, but cannot throw off so soon the impressions which have fixed themselves upon us during our visit. To look upon the long row of workmen, intelligent, well to do, and industrious, gives one new ideas of the value of well-directed labor. Among the contractors are some who have made fortunes by their own industry and ingenuity. One of these persons was pointed out to us, who made his drawings for new machines so perfect that the men constructed these directly from the design; and if the tools were found inoperative or useless, the defect was through some radical fault, not in any want of precision in the drawing.

It has been remarked and lamented by various writers that the romance of the seamstress or sewing woman's life has been destroyed by the introduction of machinery. If, in speaking of romance, it is intended to recall dark and cold garrets, fireless and foodless rooms, scanty and insufficient raiment, and starvation and temptation to nameless vice generally, then we fully agree with those poetasters, who deplore the loss of their occupation, that the gloomy pictures which we have mentioned are among the past. Aladdin wore a ring upon his finger, which caused, when he rubbed it, a fierce genii to appear who gave him sundry and manifold possessions. But what was Aladdin and his swarthy slave to our modern servant, who performs tasks with an ease and celerity that would have made the homely old ogres in ancient story stretch and strain their mighty sinews in vain? It would be a fine fancy to suppose all the material operations of nature suspended for awhile, and to let sound cease, and the roar and rush of clashing humanity still for a time its turbulence. Then from the remote parts of the globe, nay even from the borders of the desert, let the sewing machines begin their song; say, what theme could be like that? No English lark, soaring at day dawn from the green bosom of the fields, trills forth such strains; for the bird's hymn is but the natural impulse which the earth's bounty suggests, while the whir of the sewing machine tells of the power and strength of the human brain. It boasts of the attributes imparted to it, and carries conviction to every hearer, that, through the steady pursuit and triumphant achievement over great obstacles, the sewing machines have won their way in the world until they stand almost as new mechanical forces.

We cannot imagine anything more capable of being wrought into an original and beautiful romance than the invention and results of the sewing machine. By the fountain in the desert the Bedouin may fill his water-skins, if he chooses, whose seams no longer let through the precious fluid. The Turks in their lethargic sittings may band their dusky foreheads with turbans white and fair with pearl-like stitches; or away through the tall grass of the Western prairies, the horseman flies like the wind, with the scarlet blanket streaming from his back, bound and hemmed by the Wheeler and Wilson sewing machine. The contemplation of its resources opens at once to the reflecting person a long vista of delightful fancies upon which we should like to dilate at length. Let us, however, close our article with the assurance that whatever old associations have been removed by the use of the sewing machine—the good wife sitting at her fireside with the slow-plodding needle, or the maiden at her lattice singing over her embroidery—the loss has been more than repaid by the increased benefit to mankind and the great human family, throughout the habitable globe, by increased comfort as well as great pecuniary gain.

To the able and indefatigable President of the Company, Mr. Wheeler, we are under great obligations for facilities afforded and much valuable information, as also for personal courtesies, to do justice to which type are wholly inadequate.

VALUABLE RECEIPTS.

Cider and Other Wines.—When cider has fermented for about one week in a cask, add half a pound of white sugar to every gallon; then allow it to ferment further until it has acquired a brisk and pleasant taste. An ounce of the sulphite of lime is then added for every gallon of cider in the cask, and the whole agitated for a few minutes and then left to settle. The sulphite of lime arrests the fermentation, and in the course of a few days the clear cider may be poured off and bottled, when it will retain the same taste that it had when the sulphite was added. About an ounce of the sulphite of lime added to the gallon of cider in any stage of fermentation will preserve it from further change. A sparkling cider wine is produced by the mode described. The following is another method of making cider wine:—Take pure cider as it runs from the press and add a pound of brown sugar to every quart, and put it into a clean cask, which should not be filled to within about two gallons of the top. The cask is then placed in a moderately cool cellar or apartment and the cider allowed to ferment slowly by the bunghole being left open until it has acquired the proper taste and sparkles when a small quantity is drawn. The cask is then bunged up tight.

We have given these receipts for what they are worth, because they are followed by many persons making wine artificially from cider, but a real pure and first-class wine cannot be manufactured by the use of cane sugar in vegetable juices. It is a remarkable fact that currant, cider, grape and other wines that are made by adding common cane sugar to fruit juices are very similar in taste—the flavor being what is called "smoky." This is due to the fermentation resulting from cane sugar. The vinous fermentation of the pure juice of the grape is due to grape sugar, which is entirely different from that of the cane.

Grape wine should be allowed to remain for a long period in oak casks after it is made, before it is bottled, otherwise it will be comparatively sour to the taste. This is owing to the great quantity of the tartrate of potash in the juice of the grape. When standing in a wooden cask the tartrate is deposited from the wine and adheres to the interior surfaces of the vessel, and it forms a thick and hard stony crust called "argol." This is the substance of which our cream-of-tartar and tartaric acid are made. In its crude state it is employed by silk and woolen dyers in producing scarlet, purple and claret colors in conjunction with cochineal and logwood. This explains the cause of wines becoming sweeter the longer they stand in casks in a cool situation.

Wines may be made of the juice of the sorghum cane by permitting it to ferment for a short period in the same manner as has been described for cider, then closing up the cask tight to prevent access of air. The fermentation of all saccharine juices is due to the combination, chemically, of the oxygen of the air with some of the carbon in the sugar of the juice. A small quantity of alcohol is thus generated and absorbed by the fermented juice. Carbonic acid gas is also generated; when absorbed by the liquid and retained under pressure this gas imparts the sparkling property to wine. When the saccharine juices are undergoing fermentation they must be tasted frequently for the purpose of arresting the fermentation at the proper stage, because there are two stages of fermentation, called the vinous and acetous. The first is that in which alcohol is produced; the second vinegar. Many artificial wines have a slight vinegar taste which is caused by allowing the fermentation to proceed a little too far. These hints will be useful to those who prepare light domestic wines. These are now made very generally, and are held to exert a favorable influence in many cases of dyspepsia.

Ointment for Chapped Hands.—Take sweet oil, 3 ounces; spermaceti 4 ounces; and pulverized camphor, 1 ounce. Mix them together in a clean earthenware vessel by the aid of gentle heat, and apply it warm to the hands night and morning. Another very good ointment for chapped hands is made with a little fresh newly-churned butter and honey.

Sulphurized Oil for Wood.—M. Lapparent, inspector of timber for the French navy, states that he prepared a paint for preserving timber composed of linseed oil, sulphur and manganese, which was found very effectual. The flowers of sulphur were stirred into linseed oil in about equal quantities, by weight, and about twelve per cent of the oxide of manganese added. This was applied to some oak logs which were buried in a manure heap for six months, when the wood was found to be uninjured—no fungi were formed upon it. Unprepared wood subjected to the same treatment was covered with fungi.

Decline in the Price of Rags.—The Boston *Journal* says:—"Rags are going down. On Wednesday they fell two cents, and greater declines are threatened. The amount of paper stock which the present high prices has brought forward is immense. Old paper has fallen to four cents a pound, and one party in this city, who has been buying very largely, has stopped purchasing, having now over 50,000 pounds on hand. Those who are hoarding their rags or old paper had better sell at once."

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POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute on Thursday evening, Dec. 18th ; the President, Mr. Tillman, in the chair.

SISAL HEMP.

Mr. Stetson—The town of Sisal, on the north coast of Yucatan, gives its name to a vegetable fiber which is attracting a great deal of attention at the present time. The fiber is obtained from a species of cactus, the *Agave Americana*, and has been used heretofore principally in the manufacture of cordage. It is collected by the natives and prepared for market by a very laborious process. After bruising one of the leaves with stones, they scrape off the fleshy portion, by drawing the leaf with one hand a great many times under a scraper or comb, which is held in the other hand. A great deal of effort has been made to devise machinery for performing this labor, and at last these efforts have been crowned with success. The leaf is fed, between two fluted rollers, into the space between a swiftly-revolving drum and the inside of a cylindrical case ; the drum carrying upon its periphery a number of combs which scrape the fleshy portion of the leaf from the fiber. One man can clean by hand two or three pounds of the fiber per day, while with this machine two men will clean say 500 pounds per day ; and the fiber prepared by the machine is far superior to that prepared by hand, as you see, from these samples. This mat was made by the natives in Yucatan, and these bundles were prepared by the machine. This fiber has been collected heretofore in small quantities from the natives, but by the introduction of machinery the laborers will be gathered at manufactories, and this simple machine promises to effect a complete revolution in this industry, similar to the effect produced on the cotton culture by the invention of the gin. Mr. Patrullo has six machines running on his plantation, and he hires his laborers at 10 to 12 cents per day. [The machine referred to was Patrullo's, illustrated on page 353, Vol. IV., Scientific American (new series), improved and simplified by subsequent inventions.]

VENTILATION.

Mr. Hyslop—Mr. Chairman, in order to show the utility of my invention I will make some experiments to illustrate the principles of ventilation. I will first show that a room cannot be ventilated simply by one opening in the top. This bell glass has a large opening, as you see, in the top, and I will place it over this lighted candle. You see the candle fades for want of air and goes out. Now I will show that an opening in the top of a room and an opening in one side near the bottom, produces very imperfect ventilation. I place these two candles under the bell glass, and raise the glass a little on one side. You see that the flame just above the opening is extinguished for want of air; while the flame upon the opposite side of the glass is agitated by the incoming currents of cold air. Now I will close the opening below and place my ventilator in the orifice at the top. This ventilator consists, you see, of two concentric pipes, the inner one for the escape of the warm air extending higher than the outer one through which the cold air enters. Now I will hold this smoking paper at the mouth of the cold air pipe, and the course of the smoke will show you how evenly and gently the incoming air is distributed throughout the room.

STEAM ENGINE VALVE.

Mr. Fisher—The piston valve for steam engines would be used more than it is were it not for one objection. The piston is liable to be heated more quickly than the valve cylinder, causing the piston to bind so firmly that the valve stem has been pulled apart. Mr. Davis has overcome this difficulty by inclosing the valve cylinder in a steam jacket so that the cylinder will expand as quickly as the piston ; and by a plan for tightening the piston in the cylinder. [This plan of tightening would require engravings to make it intelligible.]

BREECH-LOADING RIFLES.

The President—The regular subject of the evening, "Modern Improvements in Warfare," will now be taken up, and will be opened by Mr. Bartlett, who will present the Burnside rifle.

Mr. Bartlett—This is the rifle which was invented in 1856 by Major General Burnside. In 1857 the Secretary of War appointed a commission of military officers to examine all the breech-loading small-arms in the country with a view to the selection of the best one for use in the army. The board met at West Point and had some twenty guns submitted to their inspection, including the most famous breech-loaders in the country. They submitted them all to tests for accuracy, range, convenience of loading, liability to get out of order, and other material points, all in the thorough manner characteristic of our West Point officers. In their report they unanimously give their preference to the Burnside rifle. In 1858 a second board was appointed by the War Department, and they had about a dozen breech-loaders submitted to their examination. After trying them in the same thorough manner, this board also gave their preference unanimously to the Burnside gun. [The speaker then explained the gun, and passed it around among the crowded audience, most of whom came for the express purpose of seeing the weapon, as its exhibition had been announced in the morning papers. The Burnside rifle was fully illustrated on page 385 Vol. VII. of the Scientific American (new series).]

Dr. Rich—I would like to know on what grounds this rifle is pronounced superior to all other breech-loaders ?

Mr. Bartlett—I shall have to refer the gentleman to the military boards. To my mind the peculiar solidity of the breech is a very important advantage over any other breech-loader that I have examined. When the parts are in place the breech-piece is surrounded by thick plates of iron at the sides, and it rests against a solid wall of metal in the rear ; this construction rendering the arm remarkably safe from being blown to pieces or from injuring the holder in any way.

Mr. Dibbin—One advantage of this gun over those breech-loaders that use a paper cartridge, is the perfect closing of the joint against any escape of gas. If the gas escapes it wears away the metal and constantly enlarges the opening. Many people seem to have an idea that a gun is valuable in proportion to the rapidity with which it can be fired, but for army use very rapid firing is of no great value. I doubt whether breech-loaders will ever come into general use for infantry.

Dr. Rich—The opinion is becoming very general among army officers that the power to load very quickly is of the very highest value. If a soldier hurries through a long process of loading he is very likely to raise his gun and fire in the same hurried manner without any care in regard to his aim ; but if he can leisurely slip his cartridge into the breech in a moment, he is more apt to spend the proper time in taking aim. The battle of Ball's Bluff was won by the rebels in consequence of their being provided with Maynard's breech-loading rifles.

Mr. Stetson—The difference in the time required for loading a gun at the muzzle and that required for loading it at the breech is less than is generally supposed.

Dr. Rich—Breech-loading rifles are loaded and fired without difficulty fifteen times in a minute ; can any muzzle-loaders approach this ?

Mr. Bartlett—Mr. Chairman, there is one point in relation to this rifle that I omitted to mention. In my experience in hunting deer and other game, and in shooting at targets, I have never yet found a breech-loading rifle that would carry with any accuracy. The manufacturers of this rifle claim that the bullet is so placed in the gun that its axis coincides precisely with the axis of the bore, and that it is as accurate as the very best muzzle-loader. This is the claim, whether it will turn out to be well founded or not I do not know. I have for some time regarded as one of the most interesting problems of the day the production of a breech-loading rifle that will shoot with perfect accuracy.

Dr. Rich—I can inform the gentleman that Maynard's rifle challenges any gun, either breech or muzzle-loading for accuracy of shooting.

Mr. Bartlett—The Burnside Company are manufacturing at present exclusively for the army, but as soon as they are ready to put their target rifles in the market, if the challenge of which the gentleman speaks is still standing, there will probably be a very interesting trial.

Mr. Page—When Sharp's rifles were first brought out we had one at Utica and tried it in competition with one of James's muzzle-loaders. We could not succeed in hitting the bull's eye with the Sharp's rifle, and finally discovered that it was owing to the fact that the bullet was not placed in the gun with the point exactly forward, and consequently, as it was sent with a whirling motion out of the gun, it wabbled wide of the mark. I believe that has been remedied, however, as well as the escape of the gases.

Dr. Rich—In stating the challenge of the Maynard arm, I should say that it refers to rifles only that are in actual military service.

Mr. Bartlett—I am glad to hear this explanation, as I have never yet met with a breech-loader that could compare in accuracy with a good muzzle-loader, Clark's for instance. But the maker's of the Burnside gun claim that it is equal in accuracy of shooting to the very best muzzle-loader. The shot is placed in the cartridge by mechanism, and then the cartridge is so placed in the gun that the axis of the bullet coincides with that of the bore with mathematical precision.

Dr. Rich—This is secured by any gun that uses a metallic cartridge case.

Mr. Bartlett—It is necessary not merely to employ a metallic cartridge case, but to place it in the gun so that the axis of the shot shall coincide with that of the gun, not pretty nearly, but with mathematical precision. A good rifle-shooter will not take a gun as a gift unless it carries with perfect accuracy.

SPHERICAL CANNON.

Mr. Wiard—The latest experiments seem to prove that shot will pierce armor plates of greater thickness than any vessel can carry, and we must have forts for the defense of our harbors. This drawing illustrates a fort for the defense of New York harbor that would be impregnable and that would be an absolute bar to the passage of vessels. It is a conical mass of masonry surmounted by a revolving turret fourteen feet in diameter and provided with two spherical rifled cannon, each weighing 51 tuns and carrying a shot of 1,000 lbs. [The details of the invention were exhibited by drawings.] The turret is revolved and the guns are turned and loaded by steam power ; the engine and workmen being placed in the body of the masonry. The guns are composed of three metals so combined as to compensate for the expansion of the inner portions of the walls from heat, and thus prevent the guns from being burst by the heat.

REVOLVING TURRETS AN AMERICAN INVENTION.

The President—It has been supposed that Captain Ericsson originated the revolving turret, but the truth is it is an American invention. It was first invented in this country by Mr. Vandervere ; then it was invented and patented by Mr. Timby ; and here is a model of a revolving fort which we have just found in the model room of the American Institute. It is marked "Caleb L. Ferris, 1846." You see that it is a perfect revolving floating turret.

The same subject in connection with that of "Inland Navigation" was selected for the next meeting, and the Association adjourned to Friday evening, Dec. 26th.

Pea Cheese.

There is a very close resemblance between several animal and vegetable substances. Thus animal milk contains a large quantity of caseine, which is the principal substance in cheese ; and peas also contain a large amount of the same substance. The Chinese, who have exhibited such an aptitude for domestic economics, that they even make soup of birds' nests, have also found out that cheese can be made of peas. For this purpose peas are boiled into a thin paste, then passed through a sieve, and an acid added to the pea solution, which becomes curdled like sweet milk by the action of the common rennet upon the latter. The solid part is then salted, pressed in cheese molds, and it gradually acquires the taste and smell of cheese. It is sold in the streets of Canton under the name of "Taofoo," and when fresh it is a favorite article of Chinese food.

In the second half of the 15th century, Russia was but 18,000 square miles in extent. Now it covers 392,000 square miles. In 1722 the population of the empire was 14 millions ; now it is 65 millions.

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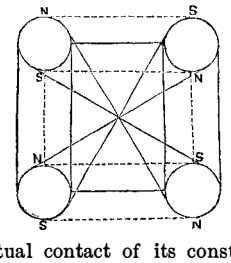
Correspondence

On the Formation of Clouds.

MESSRS. EDITORS :—Throughout nature we see the peculiar affinity that air has for water, and, in fact, most liquids—it would seem almost that this must be due to some more direct and powerful cause than ordinary endosmic action, which latter, in fact, like capillary attraction, would seem to be an effect better expressed than in the case of either term as the "attraction of surfaces;" for, as a boulder thoroughly pulverized will float in the atmosphere, would we call this endosmic action, much less capillary attraction? This remark is made as bearing upon the wonderful phenomenon of water in the form of clouds being elevated and sustained in the atmosphere, at an altitude where the gravity of the water must preponderate 1,000 fold. The cohesive qualities of ice are well known, yet a piece of ice suspended in an atmosphere or air current of its own temperature rapidly disappears. But it will be evident at once that this evanescence of the ice cannot be due to heat in the common sense of the term, and only to a very trifling extent to the mechanical impact or attrition of the air current. It is that the atoms of air act by induction upon the atoms of the ice, because of the difference of their specific electricities, and thus they unite in a species of electro-mechanical combination (the ice being disintegrated parnicle by particle, even perhaps without immediate or simultaneous fusion), and if this view be correct it will at once be evident and consistent that water in a liquid state would be still more readily absorbed or lifted in suspension by the air even in a state of rest, and much more rapidly and extensively when either or both (the air and the water) was in motion or agitated in contact with the other. The rapidity with which evaporation takes place under such conditions without any important elevation of temperature is well known, though the latter enhances immensely the rapidity and extent of the combination. Now, when water atoms are so held in suspension in the air and the solar rays act upon them, each water atom becomes, as it were, a burning lens to its contiguous neighbor, and aids its conversion into an atom of "steam," or water imbued with what is termed latent heat, the solar ray or some property of it being thus converted into the something that is popularly expressed by that term. And as each of these water atoms, at the instant of being imbued with this latent heat, or becoming "nascent" steam, does, by an electrical affinity, absorb air and become an inflated vesicle or cloud-atom, and as the latent heat, so called, is simultaneously developed in the form of free electricity, the absorbed air is in turn electrized and highly rarefied, the vesicles thus becoming not only so many microscopic balloons as it were, but so many minute Leyden jars, and being insulated become instantly polarized, yet mutually repellant; the similar equatorial electricity of the vesicles preponderating, in this respect—repulsion—within certain limits of juxtaposition over their polar attraction, which must likewise exist, and the vesicles arrange themselves in the relations shown thus :—



This figure represents four vesicles and their polarities, the plain lines between them representing lines of repulsion, and the dotted lines lines of attraction. The latter causing their aggregation in the form of a cloud, and the former preventing the actual contact of its constituent vesicles. It would seem necessary to this part of the theory and the reconciliation of the observed phenomena, to assume that, initially, the polar forces of attraction between the vesicles preponderates; but when the vesicles have aggregated within a certain proximity, their compound mutual inductive forces cause or enable the equatorial repulsions to balance the polar attraction. An isolated cloud, it may necessarily be inferred, becomes polarized as a whole, and its upper and lower surfaces relatively positive and negative, according to the relative electrical condition of the air-stratum above or the earth below.

The commotions and changes of forms in clouds, particularly the nimbus, are only observed to take place to any material extent and with rapidity when the cloud has a corresponding motion of translation, and may be attributed to the varying inductive influences of different air-strata, or currents in unequal electrical conditions through or near which the cloud is passing.

It is deemed that the foregoing is sufficient to suggest to the meteorologist and electrician deductions as to any other of the various sub-laws governing the various phenomena connected with the formation of clouds and their dispersion, whether from gradual absorbtion or sudden deposition in the form of rain, hail, &c.; it being remarked, in conclusion, that the gradual or sudden discharge of a cloud by the removal of its electricity, permits the collapse of its vesicles (previously supporting the pressure of the atmosphere) into mere water drops with corresponding rapidity, and gravity does the rest—it rains.

WILLIAM MT. STORM.

Tempering Steel Tools.

MESSRS. EDITORS :—In a recent number of the SCIENTIFIC AMERICAN I noticed an inquiry in relation to hardening cast steel articles, and keeping them straight during the operation. The conditions most favorable in preserving the shape of steel articles, during the process of hardening, is uniformity of thickness in their entire length and breadth, also uniformity of heat, and the application of the hardening medium to all parts alike. If the articles are long they should be dipped, while heated, perpendicularly in the direction of their length, and should not be swayed from side to side. Even with these favorable conditions success is beyond the skill of man unless the metal is homogeneous. The remedy which I have recently discovered is within the reach of all. It consists in a mode of straightening the hardened steel article. I apply a gentle heat to the concave side of the hardened article and pressure upon the opposite side. I have taken a piece of steel about five inches long, an inch wide, and one-fourth of an inch thick, which had been sprung in hardening over one-fourth of an inch, and by the method described have brought it straight without drawing the temper below a pale straw color.

I have also succeeded in making cast steel very soft by annealing, without injuring its qualities for working. In using steel thus treated for small tools I hammer it cold. This treatment seems to increase its conducting power, and causes it to harden at a low temperature. When I can use a dry grindstone in grinding the article into shape I do not heat it in the fire, as by the ordinary method of dipping it into oil or water to harden it, as by proper management I bring the tool up to the proper heat on the grindstone by the friction, about the time it is reduced to the shape desired. I have in this way finished small drills three-eighths of an inch in thickness, at the rate of one in five minutes.

E. BURROUGHS.

Chicago, Ill., Dec. 22, 1862.

MESSRS. EDITORS :—In the "Notes and Queries" of the SCIENTIFIC AMERICAN of December 6th there is an inquiry from G. S., of Connecticut, respecting the best method of tempering large flat tools without springing them. Those who have had much communication and business with smiths know that each claims to possess a secret by which he can harden and temper tools better than any other person. Copperas and salt dissolved in water forms a very common hardening medium among them. It is pretty well known that the quicker steel is cooled the harder it becomes, and all the mixtures used in water are chiefly to cool the metal rapidly.

Having been employed in a manufactory of edge tools and in another where mill picks were made, I have endeavored to learn something of the art of tempering tools of all kinds, from a cold chisel to a trip hammer. Thousands of mill picks were made annually at one of these places, and these were all tempered by one man, who was so noted for his skill in this line that I have known of picks being sent to him for dressing and tempering from west of the Mississippi. He told me that the great secret of his art was in "preparing the steel right." When a large thin tool or a mill pick is hammered more on one side than the other, or flattened considerably at one heat and then narrowed at another, it cannot be hardened and tempered without cracking or springing at the corners. The steel should be heated equally for hammering and for tempering, otherwise the contraction will be unequal when it is

The best way of heating large thin tools for [illegible] is dipped into this and retained until it is heat equally throughout; and as the temperature of the lead is known and equal, it is a safe medium for heating tools.

Warm water, which has been proposed by some persons, is not a suitable medium for hardening tools. In proof of this assertion being correct, take a large die of about twenty pounds in weight, heat it for hardening, and then plunge it into a tub of cold water, and it will come out soft. The steel contains so much heat that its surface is kept hot until the surrounding water becomes hot, and then it will not become hard. Dies are hardened by permitting a stream of water to fall upon their surface. Many other articles can be hardened in no other manner.

H. WHEELER.

Silver Creek, N. Y., Dec. 24, 1862.

[Files are hardened by heating them first in a bath of molten lead, then plunging them into cold salt brine. Before heating they are coated with a paste of flour and salt. Anvils are hardened as described by our correspondent for dies. We have seen many anvils hardened, and the cold water was always permitted to fall upon their surfaces from a hight of several feet. Mr. Henry Diston, of Philadelphia, who is distinguished for the manufacture of flat steel tools, informed us that the best way to temper dies was to hold them slightly inclined, and allow the cold water to fall from a head upon their faces.—EDS.

Rifles and Projectiles.

MESSRS. EDITORS :—I am exceedingly pleased to see the Rifle question still discussed in your valuable journal. "R. H. R.," of Indiana, and "J. D.," of Chatham, C. W., have raised the question of different sized bores and balls for rifles—a very important one indeed. It seems to me that neither of them are exactly right, while both are partially so. The first is in favor of the small bore, and the latter, large ones. I agree with "J. D.," as to the small bore answering for short, but not for long distances, because of the want of sufficient weight of metal in the ball, and want of room in the chamber to burn sufficient powder. But cannot this be overcome? I think it can. He evidently goes upon the supposition that the balls of the large and small bore guns shall be made of of the same shape, and consequently that their relative weight shall be in proportion to their diameter, or that of the bore. In other words, if I understand him, he takes as his standards of comparison, round balls. But why need we adhere to the same shape of balls in large and small bore guns? In fact we do not. Almost every variety of shape has been already tried, amounting to, at least, a thousand in number.

Now, my idea is this, that the ball of a small bore gun, by changing its form, may have the required weight and quantity of metal, without increasing its diameter, and consequently without increasing its atmospheric resistance. It being admitted that the resistance is in proportion to their respective diameters, it follows, of course, that with two balls of equal weight, propelled by equal power, the ball having the least diameter (provided it be not reduced to too great an extent) will meet with the least resistance, and, therefore, go furthest. Now, if this be correct, as I believe it is, then all we have to do is to use the small bore, and increase the length of the ball sufficiently to give it the required weight, in fact, to make it resemble a short bolt, rather than a sphere in shape. Of course, care must be had, that the front end of the ball be of the best form for cleaving or penetrating the air, and also that the front portion be heavier than the rear, in order to secure its keeping point foremost during its flight. I anticipate the objection to this, suggested by "J. D.," namely, want of room in the chamber to burn sufficient powder to create the required projecting force, and the

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effect of side wind in varying the long ball from its direct course. I propose to remedy or avoid the first objection by enlarging the chamber sufficiently to contain and burn the required quantity of powder. I am aware that this involves several very nice questions; as, for instance, the best shape or form of the enlargement of the chamber, the resistance of the converging walls of the chamber, &c. Yet, when we bear in mind the fact that the gas produced by the combustion of the powder operates in the same manner expansive forces, this objection will not be found to exist in practice. It may be that the force exerted upon the ball at the instant of combustion may be less than in the ordinary-shaped chamber, but if so, it will continue to operate for a greater length of time, and to a greater extent of the passage of the ball through the barrel, which I believe would be an advantage, for these reasons: 1st, the ball will start with less initial velocity, and thus avoid the danger of stripping; 2d, the force will continue to be exerted upon the ball during its entire passage through the barrel, which we know is not ordinarily the case, in long barrels. This will secure the use of longer barrels, thus ensuring greater accuracy of sight and aim, and consequently of range. The other objection, of the effect of side winds, will be counterbalanced by the increased velocity of the ball, or partially so, at least. This is a difficulty against which we have to contend in all projectiles, and can only be overcome by a thorough understanding of the whole subject, and a nice calculation, at the time of firing—depending upon the force of the wind, the length of range the extent of area presented to the wind, and the velocity of the ball.

This whole subject is one of great interest to me, and I believe to the public at large. I should greatly rejoice to see Congress make an appropriation sufficient to conduct a series of experiments which should settle, not only these, but all the other vexed questions in regard to the best style of gun and ball—including length of barrel, kind of twist, size of bore, &c. RIFLEMAN.

Washington, D. C., December 20, 1862.

The Size and Pitch of Machine Screws.

A correspondent having seen an article in this journal lately, upon the above subject, sends us the following sensible and practical remarks:—

MESSRS. EDITORS:—The "Pitch of Machine Screws" is the title of an article in your paper of the 13th ult.; and as I experience the troubles therein set forth daily, I will give you my views on this matter. I find, on comparing the number of threads per inch given in your article for several diameters, that they do not agree with the Whitworth standard, now used by the best machinists and bolt-makers in Philadelphia and other cities, [a mistake; look again.—EDS.] and also adopted by Haswell, Scribner, and other compilers of works for mechanical engineers. As some of your readers may not have the list of sizes of heads and threads, I will copy it:—

Diameter.....	¼	5-16	⅜	7-16	½	⅝	¾	⅞	1	1⅛	1¼	1⅜	1½
No. of threads per inch.....	20	18	16	14	12	11	10	9	8	7	7	6	6
Short diam. of head and nut..	7-16	½	⅝	¾	⅞	1⅛	1¼	1½	1¾	2	2¼	2½	2⅝

Depth of nut....About the same as the diameters.

Another trouble exists in the screw quite as important as the pitch of the thread, viz., the diameter. The bolt manufacturers conform their taps and dies to suit the iron, instead of adopting some standard measure or parts of an inch of their own; for the reason, probably, that the rolling mills fill orders for 1-inch iron, but in a tun there will be found some rods which will exceed the proper size by one-sixteenth of an inch. This should not be the case, and consumers of iron should insist on having iron of the size ordered. They should not change their tools to suit inaccurate rolling-mills. The machinist is now compelled to have two sets of taps and dies—one set to suit the bolts manufactured, the other to conform to standard measurements. This practice involves trouble in the shop; as the taps are marked alike, the workmen will use the rough-bolt tap where it was intended to use the standard one. We have found it less trouble to use the bolt-makers' size, and conform the finished screws to it. I hope, however, some arguments may induce the bolt manufacturers and machinists to adopt the Whitworth standard of diameters, or some other equally good, as well as an even number of threads to the inch. Some of the bolt manufacturers are large consumers of iron, and require the full capacity of a rolling mill for their supplies. They could easily demand to have the iron made of the proper size to finish to the standard. The iron merchants would certainly find it to their interest to supply the sizes called for

New York, Dec. 17, 1862.

Illuminating Gas.

AT a late meeting of the London Chemical Society, Mr. Parrett stated that some time ago, while MM. Buff and Wöhler were making some experiments upon electrolytic decomposition, they employed a plate of the metal aluminum as the negative terminal of the battery for the decomposition of water; and as soon as the electric current was established, they were surprised to find that, instead of pure hydrogen gas being evolved, as is usual with a platinum plate, a gas was evolved which inflamed spontaneously. Upon investigation, this gas was found to be composed of hydrogen and silicium, the latter being an impurity in the aluminum plate. Several processes have recently been adopted for preparing this gas. Silicated hydrogen and the silicate of magnesium were found to furnish the best materials for producing it. Dr. Hoffman recommends the following mode of making it;—Take 80 parts of fused chloride of magnesium, 70 parts of silico-fluoride of potassium, 40 parts of sodium cut into small pieces, and 20 parts each of the chloride of potassium and sodium. These ingredients are mixed together dry, placed in a clay crucible, and quickly heated to redness. The product thus obtained is a silicate of magnesia (Mg^2 Si.). When this is triturated in a mortar with hydrochloric (muriatic) acid, it gives off an abundance of gas, which keeps up a lively combustion in the mortar. A bottleful of this gas, prepared by Dr. Hoffman, was let off by a tube through a trough containing dilute hydrochloric acid, and as it escaped in bubbles at the surface of the liquid, these inflamed immediately and spontaneously when they came in contact with the atmosphere. Each bubble produced a white flame, like that of phosphoreted hydrogen. The combustion formed flakes of silica, which resembled fumes of burning zinc. This is one of the most dangerous gases, and further investigation may prove that many mysterious fires, directly attributed to spontaneous combustion, may be due to it. Dr. Hoffman believes it is a marsh gas of the silicon series.

Every new discovery in science, while it extends the domain of useful knowledge, also opens up a wider and grander prospect for future exploration. What triumphs are due to recent chemical research, and yet how very little is known of nature's grand operations! The discovery of this new inflammable gas may be a golden wedge which will cleave and open up some of nature's deepest mysteries.

Iron-works in America.

The manufacture of iron in the United States may be divided into three departments—first, the blast furnaces using anthracite coal, charcoal, raw or coked bituminous coal; second, bloomeries or mountain forges, which turn ore or cast iron into blooms or malleable iron; and third, rolling mills converting these into bar, rod, sheet and nail-plate iron, and into rails. In 1857 the works of these kinds amounted to about 1,131, namely, 121 anthracite furnaces, 500 charcoal and coke furnaces, 300 forges, and 210 rolling mills; and the entire production of iron was about 783,000 tuns, a decrease upon the previous year of 73,235 tuns, for in 1856 the total domestic produce of pig and of rolled and hammered iron was 856,235 tuns. In 1859 there were only eight States of the Union destitute of iron-works—Mississippi, Louisiana, Florida, Texas, Iowa, Minnesota, California and Oregon. The remaining twenty-five were employing 560 furnaces, 389 forges, 210 rolling mills; in all, 1,159, producing 840,000 tuns—an increase, in two years, of twenty-eight works and of 57,000 tuns of iron. In 1856 the Pennsylvanian iron-works produced 243,484 tuns of anthracite iron; in 1857, 237,318 tuns; in 1858, 185,000 tuns; and, in 1859, 286,332 tuns. To this may be added the production of charcoal iron, amounting to 39,500 tuns. The fall in the manufacture of 1858 was caused by the crisis of the previous year, produced by over-speculation in the West. The quantity of iron of all kinds, used in every form of manufacture in the United States, was calculated, in 1856, to be 1,330,548 tuns. Of this quantity 817,356 tuns were rolled and hammered iron, 298,275 tuns of which were imported, the remaining 519,081 tuns being domestic produce. The domestic pig iron consumed in the same year was 337,154 tuns, and of foreign 56,403.

There was a marked increase in the production of the Pennsylvanian rolling mills; large orders were received for rails from the South and West. The railroads in those parts of the Union had originally been mainly constructed of imported rails, of a cheap and inferior quality, which had very soon become unfit for use, and it was soon discovered to be better policy to pay a higher price for more durable iron. The larger rolling mills for railway iron in Pennsylvania are the Cambrian Mills at Johnstown, the Phœnix Iron Company at Phœnixville, the Montour Mills at Danville, the Lackawanna Mills at Scranton, and the Rough and Ready at Danville. The production of rails in 1859 was 104,350 tuns; in 1858, 65,500 tuns; in 1857, 70,000 tuns; and, in 1856, 76,300 tuns. During the latter part of 1857 the mills were wholly or partially closed. The activity of the iron manufacture in Pennsylvania continued during the first part of 1860, but since October in that year it has of course experienced a severe check. Many of the mills that had stopped work through the secession movement have again resumed active operations, especially those devoted to the rolling of plates. The demand upon them for Government iron-plated vessels has been greater than the capacity of such mills to supply.

Wonders of the Atmosphere.

The atmosphere rises above us with its cathedral dome arching towards heaven, of which it is the most perfect synonym and symbol. It floats around us like that grand object which the apostle John saw in his vision, "a sea of glass like unto a crystal." So massive is it that when it begins to stir it tosses about great ships like playthings, and sweeps city and forest like snowflakes to destruction before it.

And yet it is so mobile that we have lived for years in it before we can be persuaded that it exists at all, and the great bulk of mankind never realize the truth that they are bathed in an ocean of air. Its weight is so enormous that iron shivers before it like glass, yet a soap ball sails through it with impunity, and the tiniest insect waves it aside with his wing. It ministers lavishly to all our senses. We touch it not, but it touches us. Its warm south wind brings back color to the pale face of the invalid; its cool west winds refresh the fevered brow and make the blood mantle to our cheeks; even its north blasts brace into new vigor the hardened children of our rugged climate.

The eye is indebted to it for all the magnificence of sunrise, the brightness of midday, the chastened radiance of the morning, and the clouds that cradle near the setting sun. But for it, the rainbow would want its "triumphant arch," and the winds would not send the fleecy messengers on errands around the heavens; the cold ether would not shed snow feathers on the earth, nor would drops of dew gather on the flowers. The kindly rain would never fall, nor hail-storm nor fog diversify the face of the sky; our naked globe would turn its tanned and unshadowed forehead to the sun, and one dreary, monotonous blaze of light and heat dazzle and burn up all things.

Were there no atmosphere, the evening sun would in a moment set, and, without warning, plunge the earth into darkness. But the air keeps in her hand a shield of her rays, and let them slip but slowly through her fingers, so that the shadows of evening are gathered by degrees, and the flowers have time to bow their heads, and each creature space to find a place of rest, and to nestle to repose. In the morning, the garish sun would at one bound burst from the bosom of the night, and blaze above the horizon; but the air watches for his coming, and sends first but one little ray to announce his approach, and then another, and then a handful; and so gently draws aside the curtain of night, and slowly lets the light fall on the face of the sleeping earth, till her eyelids open, and like man she goes forth again to labor until evening.—*Quarterly Review.*

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English Iron-clads.

The progress of the *Royal Sovereign*, an English line-of-battle ship, cut down to be fitted with Capt. Coles' revolving shields, is thus described by the London *Engineer*:—

The *Royal Sovereign* shield-ship, being converted at Portsmouth, is making rather more satisfactory progress now than a short time since. The massive timber beds on which the towers, guns, and shields will revolve, are very forward, the foremost bed, in fact, being finished, and the manner in which it has been put together reflects the highest credit on the shipwright department of the yard. The circular rims of these beds are formed of bent strips of American white oak. The central iron cylinders, one of which will be fixed in the centre of each bed, as a supporting pivot for the guns and shields, have been commenced in the smithery, but each cylinder will take some weeks in its manufacture, owing to the want of the requisite mechanical means for carrying out such unusually heavy and peculiar work. In building up each cylinder two plates are first forged, each plate being 7ft 6 inches in length, 3ft. 7 inches in width, and 4 inches in thickness. They are bent, each longitudinally in a semicircle. After this last operation has been completed under the Nasmyth hammer, they are conveyed to the steam factory to have their edges bevelled, for welding, which is carried out in the smithery with "binding" iron. The rough cylinder thus completed, is afterwards turned inside and out in the lathes of the steam factory. No. 1 cylinder of the *Royal Sovereign* has gone through about one-half of this process. 210 hands are now employed upon the ship, chiefly on the beds for the guns and shields, fixing the iron beams of the upper deck in readiness for receiving the plating and planking, and the fitting of the main deck. The external planking round the stern is now completed, and a gang of men are employed, under the direction of the officer who has charge of the ship's conversion, working overtime to get out the molds for her after armor plates as quickly as possible. The machinery for bending her plates is not yet in working order, but it has now reached such a stage that hopes are entertained of its being available in about ten days or a fortnight. The building which contains the hydraulic machinery and the annealing furnaces for preparing the plates has been built at the north end of the yard, near the shed under which the *Royal Alfred* is being converted from a 90-gun line-of-battle ship to a 40-gun iron-plated frigate. Workmen are now employed in preparing the launching ways and cradle for the launch of this ship, which is ordered for January next. Upwards of 200 hands are employed upon her, but great delay has taken place owing to the non-delivery of her iron beams and upper deck plating by the contractors. It is almost needless to say that as yet she has none of her armor plating attached to her sides.

Proposed Submarine Battery for New York Harbor.

Among the numerous plans of harbor defense which have been suggested to us, one by Mr. James Cochrane, of this city, possesses considerable novelty. This gentleman proposes to sink iron pipes between the forts at the Narrows, in New York harbor, or at other convenient points, from which charges of powder may be exploded under passing ships—the operator being within the pipe or tunnel, and informed by telegraph, or otherwise, of the position of the enemy's ships. An objection arises to this plan from the possibility which might arise of the tunnel being destroyed as well as the ship or battery. Since water is a non-elastic fluid, the force of the explosion would be severely felt, and it is doubtful whether such a plan could be safely adopted. We should like to receive plans and descriptions of other methods for protecting our cities from invasion by a foe.

Explosion of a Submarine Torpedo.

The Union gunboat *Cairo*, while ascending the Yazoo river, on the 11th of December last, ran on to a sunken torpedo which exploded, and so shattered the vessel at the point of contact that she sunk fifteen minutes afterward in forty feet of water. The character of her injuries is such that she cannot be raised even if the stage of water would permit it, and she will prove a total loss to the Government. No lives were lost by the catastrophe. The *Cairo* was one of the first fleet of seven iron-clads built for the Western rivers, carried ten guns, and was one of the staunchest of the fleet. She took part in the battle of Fort Donelson, Feb. 16, 1862, and in the bombardment of Island No. 10, in the Mississippi river, in March and April. This is only remarkable as being the first instance on record of one of those machines operating successfully.

A Naval "What is It."

At the Brooklyn navy yard a queer nondescript, which was commenced last summer at the yard and left in *statu quo* ever since, is to be finished at once and launched. The New York papers state that on Tuesday the employes of the yard and a few privileged visitors were thrown into excitement by the appearance in the yard of a weapon as singular as the nondescript itself. It is a gun of the strangest aspect imaginable, and seems capable of discharging 60 pounds of shot. It is made of brass or composition, and its breech and muzzle rest on a frame or pedestal of the same material as the gun. There are none of the ordinary appliances for firing a cannon attached to it. And this irregular arm is to be the battery of the "What is It." The "What is It" is a huge box near fifteen feet high and twelve feet wide, or thereabouts. It is caulked so as to be almost air-tight, and has an internal diameter of about twenty-four feet, and looks very like a tunnel inside. The gun will be within, and although, in firing it will protrude through the port-hole, a porch or "portico" covers its muzzle, That is all that can be known of the "What is It," which may be a submarine battery, with an air-gun, or a Delano infernal machine, for all the outside public may know.

MISCELLANEOUS SUMMARY.

ARTIFICIAL LEGS DISTRIBUTED AMONG DISABLED SOLDIERS.—A Washington dispatch states that on Tuesday, for the first time, artificial legs were distributed among the soldiers who have lost their pedal extremities in the service of their country. These patients are all congregated in one hospital, the St. Elizabeth. The soldiers were much pleased with the new aids to locomotion, and many amusing scenes occurred among them while trying on the artificial legs. The first individual who tried one was lustily cheered by his companions as he paraded through the wards of the hospital. All the patients will be supplied in the course of a few days. No artificial arm and hand have as yet been adopted by the Medical Department.

OBITUARY.—We regret to learn that Mr. John Marshall, so long and favorably known as an engineer of skill and experience in this city, recently lost his life in China by the explosion of a defective boiler on board of an English steamer. Mr. Marshall had been for many years in the employ of most of our large steam lines, but of late, since the introduction of American traders in Chinese waters, he has resided wholly in those parts. Mrs. Marshall, who recently arrived out, was so much prostrated by the accident and her loss that she also was taken ill and died shortly after. In Mr. Marshall's death the country and company have lost the services of an efficient and energetic officer.

A GOOD RECORD.—The steamship *Bienville*, of the blockading squadron off Charleston, has been under steam 380 days out of 420 days, the period of time which elapsed before she left her station for repairs. This is most creditable to all of her officers, and it affords a remarkable contrast to the performance of those miserable transports which so nearly went to the bottom with all their passengers.

A CHINESE stove, one of the curiosities taken from the Emperor's summer palace at Pekin, has been exhibited in London. It is a fine specimen of enamelling, consisting of a basin-like foundation, with a broad flat rim inclining upwards, upon which rests a dome-like arrangement formed of three bands and crowned by a brass knob, and from the lower portion of the basin three curtain or apron-like parts are pendent between elephant heads.

BEFORE the war broke out, 5,000,000 persons were supported in England by cotton, 30,000,000 spindles employed in the production of the yarn, and the capital absorbed exceeded $750,000,000. Four-fifths of the cotton consumed in England—800,000,000 pounds—were American.

Manufacturing Items.

Manufacturing Profits.—The Everett Mills Company, Lawrence, Mass., lately held a special meeting, at which a report was read. The capital of the company is $700,000, and the profits, up to last November, were $138,000, or over 19 per cent. The materials and goods on hand cost $215,000, and if sold at present prices would yield a very large pr st.

New Foundry.—The *Commercial Bulletin* (Bos states that a company has been formed, called the Boston & Fairhaven Iron Company, with capital stock of $30,000, of which $10,000 have been subscribed by citizens of Fairhaven. Having secured a good location, the company commenced vigorous operations last week. They purchased the old cotton factory on Laurel street, Fairhaven, known as the Acushnet Mill, which is 72 feet long by 40 wide, and 2½ stories high. To this, brick extensions are to be made on each side, viz., one story, 12 feet high and 40 feet long. A short railroad track will be laid from the rear of the works to the Fairhaven Railroad.

New Woolen Mill.—The Kennebec (Maine) *Journal* says that the erection of the new woolen mill of Colonel Thomas S. Lang, of Vassalboro', affords a remarkable instance of business energy. This mill is 200 feet long and four stories high, and required 400,000 bricks, &c. In twelve weeks from the time that Mr. Lang gave the orders for these bricks they were made, burnt and laid.

Thrifty Cotton Mill.—The Baltic Cotton Mill of A. & W. Sprague, on the Shetucket river, Conn., seven miles from Norwich, is 954 feet in length, in which there are in operation 1,334 power looms, with other machinery to match. Nine hundred and thirty-four of these looms are in one room. All the machinery is new, and comes forth from the workshop of the manufacturer with all the latest improvements. There are now employed about 900 hands, who earn $12,500 per month, and manufacture at the rate of 12,480,000 yards a year.

A Big Shaft.—The Nashua Iron Company, Nashua, N. H., have lately forged a shaft for a new side-wheel steamer. Its length is 28 feet 8 inches; diameter 21 inches; weight 29,340 lbs. This company uses a steam hammer, the head of which weighs six tons. The shaft of the steamer *Golden Gate*, that was lately lost in the Pacific, weighed 54,000 lbs.

INTERNAL REVENUE STAMPS UPON PATENT DOCUMENTS.

UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Dec. 15, 1862.

Notice is hereby given, that the following rules have been adopted for the purpose of conforming to the requirements of the Act of Congress of July 1st, 1862, entitled, "An Act to provide Internal Revenue to support the Government and to pay Interest on the Public Debt," and of the decisions of the Commissioner of Internal Revenue.

1. A stamp, or stamps, of the value of *one dollar*, will be required upon all Powers-of-Attorney dated after the FIRST DAY OF JANUARY, 1863, authorizing an attorney or agent to transact business with this office relative to applications for Patents.

2. All assignments of Patents, whether stamped or not, will be recorded, and the fact whether or not the instrument recorded is stamped will be noted upon the record.

3. No assignment directing a patent to issue to an assignee, or assignees, dated after the 1st day of January next, will be recognized by this office, unless every sheet or piece of paper, upon which such assignment shall be written, shall have affixed thereto a stamp of the value of *five cents*.

D. P. HOLLOWAY, Commissioner.

A Scientific Problem.

That "pioneer of the penny press," *The New York Sun*, maintains its issue at one cent per copy and with undiminished size, in spite of the high price of paper and materials. Its proprietor is evincing a degree of combined spunk and liberality for which he ought to be rewarded in the hearts of the great public, if not in his own pocket. *The Sun*, moreover, is one of the most interesting and readable papers which falls into our hands. It has *the news* of the day without unnecessary repetitions and prolix details. Its present daily circulation is between 60,000 and 70,000 copies.

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Improved Grain Scourer.

The object of this invention is to obtain a machine which can be attached to the curb of a millstone, and which will scour and clean the grain and prevent the accumulation of moisture. It consists of a frame (Fig. 1) supported on pedestals, which contains two cylinde s, A B ; in these cylinders are the fan wheel a ' ue ouring apparatus. There is also a hopper, C, ugh which the grain runs down to the second h per, D, situated on the top of the frame. The lever, E, is jointed at one end, and carries a sleeve or sliding joint, *a*, in its center, which limits the flow of grain into the scourer below; the other end of the lever works through a slot in the pedestal. At the top of the machine are two pulleys secured to the shafts, which operate the fan and the scourers; these parts are driven by the belt, *a''*. A rectangular box, *b*, forming an air passage, communicates with the scourers below and the fan above; a section of the same being being shown at *b''*.

Fig. 2 shows a section of the machine, disclosing the working parts. The fan, F, in the cylinder, A, communicates, as aforesaid, with the cylinder, B, by the air passage, indicated by the arrows. In the cylinder, B, are the indented plates, *m*, *n* and *o*, between which the scourer, G, works; attached to its lower surface are a number of radial beaters, *l*, arranged similar to the furrows in a millstone. The diameter of the scourer, G, is less than the cylinder; but the beaters referred to extend beyond the scourer in such a manner as to nearly fill the cylinder. Through the plate, *o*, and the frame is an aperture in which a funnel, J, is inserted. There is, furthermore, an inverted truncated cone, I, situated in another funnel, J'', whose sides are nearly parallel with the last-mentioned funnel, *d*, is merely a box inclosing the air passages leading from the scouring apparatus to the fan. The operation of this machine is as follows:—When it is attached to the curb, D'' is the spindle of the stone, and it receives motion from the bail; when not so affixed, power is transmitted through an extra pulley on the shaft, D''. The grain enters the funnel, C, passes down between the shaft and journal into the saucer, *K*; here the amount delivered to the scourer is regulated by the sleeve, *a*, which is raised or lowered as required; thus obstructing or permitting the free discharge of grain from the saucer, K. The grain being thrown out centrifugally, from the last-named part, it flows down between it and the funnel D, through the apertures in L and M, on to the scouring machinery. The rapid motion causes the grain to work toward the circumference of the scourer, between the roughened plates, *m* and *n*; the upper one being stationary while the other revolves, and the grain is thus thoroughly scoured. As the grain works off the plate, *m*, it drops down to *o*, where it is caught by the beaters, *l*, and drawn over the last-named plate to the funnel, J, through which it falls on to the cone, I. This revolves rapidly, and throws out the grain centrifugally; it then meets, lastly, with the current of air generated by the fan, and, freed from all refuse, drops into the eye of the stone. There is also a register in the box, *f*, which regulates the draught in the air passages. The cone, I, obstructing the funnel, J'', causes the air to enter it from all directions, over the top of the stone and from the eye, thus preventing moisture from accumulating about the curb.

At the Globe Mills, Tecumseh, Mich., four of these cleaners are in use, placed over the stones. The action of the draught of air made by the fan removes the moisture about the stone, keeping it cool and dry. After the wheat is received into the mill, sticks, straws and large objects in it are screened out. Next, it is acted upon by one of Shaw & Brown's improved smut machines, one of the best cleaners that has ever been brought to our notice. When this has been done, the wheat passes down into the garner, to all appearance perfectly clean; the grain is then received into the grain cleaner, and one of these will take out about two bushels of foul stuff out of every two hundred bushels that has undergone the operations of the previous machines. At the above mill the proprietor had in operation several grain cleaner of different patterns. They were all given a fair trial, but though as good as any machines of the kind, he has thrown them aside and adopted one of Simpson & Hayden's.

The patent for this invention was procured, through the Scientific American Patent Agency, on October 14, 1862, for John Simpson and William Hayden, of Tecumseh, Mich. Further information can be had by addressing Messrs. Simpson & Hayden as above.

Fig. 1

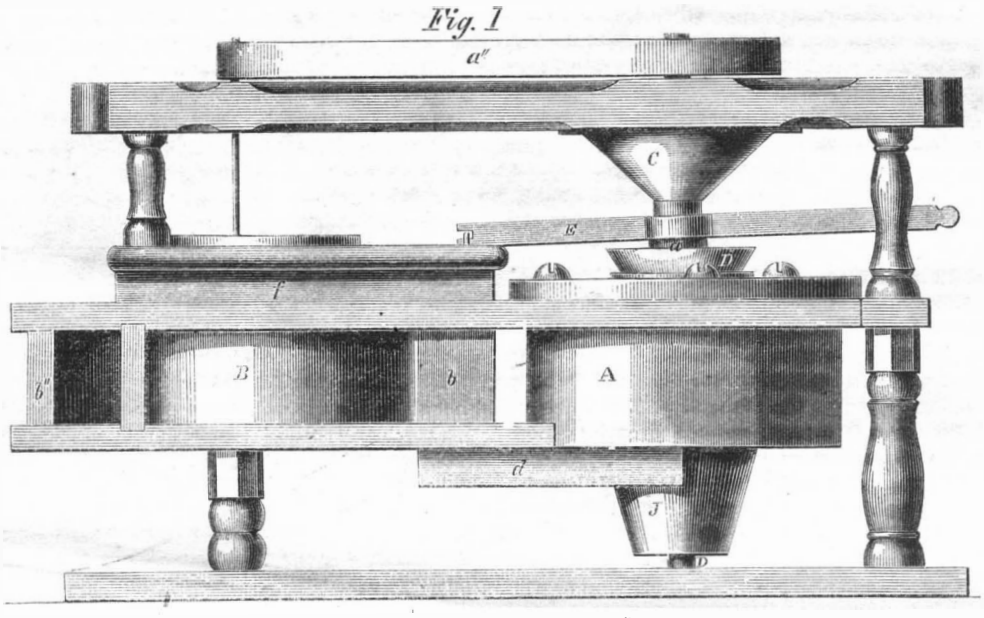
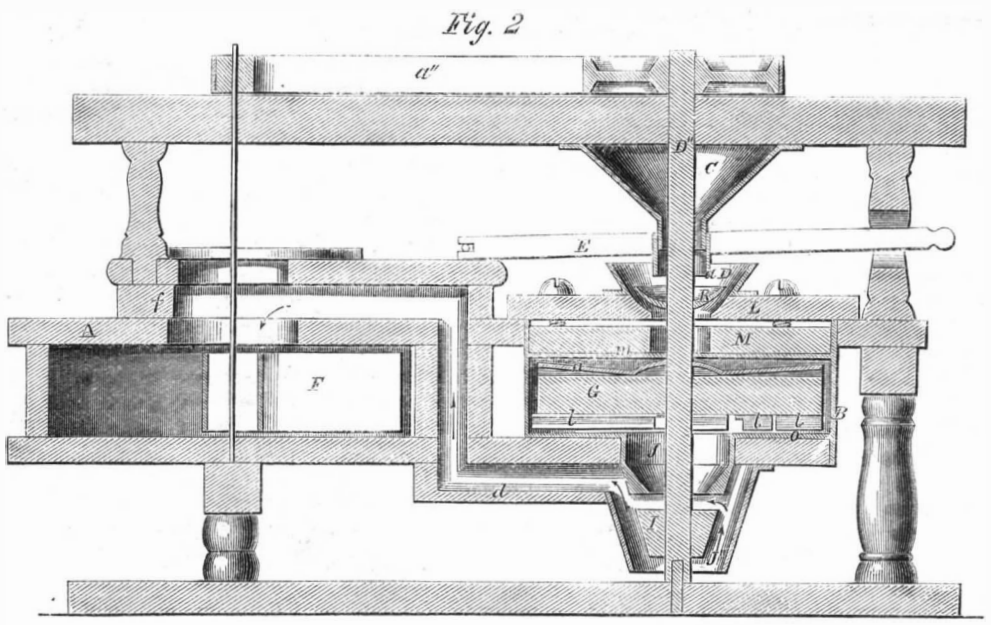


Fig. 2



SIMPSON AND HAYDEN'S GRAIN SCOURER.

POSTAGE-STAMPS are now being redeemed with postage-currency at city post-offices.

Oxygen Gas for Fevers.

In the hospitals at Danville, Ky., Dr. Shumard, Medical Director, has used oxygen gas in the treatment of typhoid fever with much success. The gas is given by inhalation, and several patients who appeared to be in the last stages of disease and beyond the benefits of common medical treatment have recovered after taking the gas. He states that three patients who had been pronounced hopeless by their attending physicians have been cured. Before giving the gas the pulse was low and the body chilly, but after the gas was administered, warmth slowly returned to the extremities, the pulse increased its volume; delirium, which had existed, disappeared, and the involuntary discharges of the bowels ceased. The gas was given in the form of nitrous oxide (laughing gas), and was made from nitrate of ammonia, by Prof. Brickford, of Danville. For want of better vessels it was administered from bladders. Dr. Shumard says, in reference to the gas used:—"Although oxygen was employed in these cases in the form of nitrous oxide gas, I would not propose to seu it so in all cases. In cholera and severe cases of congestive chill, I am persuaded that oxygen gas, in its pure form, or slightly diluted with atmospheric air, would be better; nor would I hesitate to give it in any form of disease in which the vital powers are depressed, since the cases recorded show that it relieves delirium and irritation instead of producing them."

Clean the Tools.

Nothing looks more slovenly or impairs the value of a tool quicker than the accumulation of dirt and grease in its joints or about its bearings. The filthy oil that most manufacturers use, from a mistaken idea of economy, forms a glutinous mass outside of the bearings of lathes and other machinery, in which cast and wrought-iron dust and grit collects, to the great detriment of the working parts. Aside from this fact, the drill shavings and chips from cutters, if allowed to gather in the bed, or about the foot of the tools in question, give the shop a slovenly appearance, which greatly prejudices it in the minds of observing people. A lathe or planing machine that is clean will do twice the work that a dirty one will, at less cost often; and over and over again we have watched some clumsy fellow wading around in chips or else catching one up every now and then just before it fell into some of the gears. Such a man cannot do good work, because his mind is distracted by side issues. In some shops there are rules which enforce the matter spoken of, but we should like to see it more generally practiced than it is at present.

BURNING CORN!—We learn that the Delzell Steam Mills, at Atlanta, are now run with corn for fuel instead of wood, that article being cheaper and more easier obtained than either wood or coal. We suggea the plan of using *damaged* corn.—*Lincoln (Ill.) Journs*

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VOL. VIII. NO. 1....[NEW SERIES.]....*Nineteenth Year.*

NEW YORK, SATURDAY, JANUARY 3, 1863.

TO OUR FRIENDS.

NOW IS THE TIME TO FORM CLUBS.

With the present number a new volume of this journal commences. We appeal to its friends in all sections of the country where mail facilities exist to endeavor to form clubs for the present year. We feel justified in asserting that no other journal in this country furnishes the same amount of useful reading, and especially at the extraordinarily low price at which it is furnished. The present high price of paper has rendered it necessary that we should somewhat increase the subscription price of the SCIENTIFIC AMERICAN, but by availing themselves of our clubbing rates persons may obtain the journal on very reasonable terms even now. We are obliged to pay more than double the price we did one year ago for the same quality of white paper that the SCIENTIFIC AMERICAN is printed on, while the subscription price to clubs is only a fraction more than formerly.

The long winter evening must be relieved of its dullness, and we must keep reading and thinking, and thus be prepared to overcome temporary difficulties and open new channels of wealth and prosperity. Friends, send in your clubs; at least renew your own subscriptions promptly.

PROGRESSIVE SCIENCE AND ART.

Every new discovery in science is like an increase of power in the telescope, by which a more extended view into space is obtained. New inventions do not circumscribe, but expand the range of discovery. A new abstract truth is almost apparently valueless to art when first discovered. It is like the seed of a tree or flower, that requires planting and careful cultivation It was observed several centuries ago that light turned certain white metallic salts black, but this abstract truth was like a field of grain long covered by an avalanche in an Alpine valley. The sunshine of genius at last thawed it out, and it has now developed into the wonderful and beautiful art of photography. In 1790, Dr. Galvina noticed that a dissected frog executed a hornpipe when it was attached to a copper wire suspended over an iron ballustrade. This was the germ of chemical electricity, from which have emanated electro-magnetism, electro-telegraphy, and electro-metallurgy. These two cases we have cited out of many as examples of progressive science and art. The pursuit of truth in every form is one of the chief distinctions of the human mind. Every new fact, therefore, in science, however abstract and valueless it may appear at first, should be welcomed as a treasure, for it may become the foundation-stone of a splendid temple of art.

During the past year we cannot point to any remarkable new discovery in science, but there has been a steady progress made in nearly all the arts. Two years ago, by the improved instruments of Professors Kirchoff and Bunsen, it was discovered that the flames of different substances possessed specific properties of color, with bright and dark bands. Already this invention has been applied to analytical chemistry, several new metals have been discovered, and it has opened up a boundless prospect for scientific investigation.

Chemistry and mechanics are intimate companions. The one furnishes the materials, the other the instruments of the arts. Metallurgy may be called both a science and an art. There is such a dependance of one art upon another that any improvement in one benefits all the others. From foreign periodicals we learn that some improvements have been made in Europe during the past year in the manufacture of steel. To these, and to the production of the finer qualities of steel, the attention of our metal manufacturers should be intensely devoted. Coarse steel is now made in considerable quantities at Pittsburg, Pa., but the finest qualities, that are used for making our saws, cutting instruments and wire, are imported from England. All that is wanted for the manufacture of fine steel in America is trained skill. In England, the best steel is made from Russian and Swedish iron. Every variety of iron known is native to America. We have the best materials in profusion for the manufacture of fine steel, and encouraging inducements are now presented, by the increased import duty, for our metallurgists to experiment, and thus acquire that skill which must end in success.

The scarcity of cotton has instituted a demand for new substitutes that may be employed in the manufacture of cloth and paper. Improvements in processes and machinery for treating flax may render this beautiful fibrous substance a cheap substitute. There are thousands of vegetable substances from which fibre can be obtained for spinning and weaving, but the trouble and expense of treating them to remove their gluten and bitumen and obtain the fiber are obstacles to their cheap production. The fibre of some substances is more easily obtained than others, hence attention should be directed to the cultivation, or discovery of those which are the most easily treated. Paper can be made from an endless variety of vegetable substances. The semi-civilized inhabitants of Japan, in several respects, are in advance of the skilled nations of Christendom in the art of paper-making.

Had we space we could allude to quite a number of other subjects connected with science and the arts to which the attention of inventors, manufacturers, scientists and others should be directed in commencing a New Year. Let not small things be overlooked; observation should be minute and penetrating. There is not a single science or art that can yet be called perfect. By patient thought and industry great improvements may be made in them all. Who knows but that some neglected or obscure truth in science may be developed into a splendid art during the incoming year? The past is fraught with encouragement, the future is full of hope.

STEAM WAGONS UPON COMMON ROADS.

THE introduction of steam carriages on common roads has been a pet project of inventors for many years. The advantages arising from their use are many, but the objections to them must also have due weight when their employment is proposed. The progress of the street locomotive, practically considered, has been very slow in this country, few comparatively having been built which can be noticed at all. Of those lately in operation, the Lee & Larned steam fire-engine is, perhaps, the most successful one, viewed either in point of speed or capacity for carrying moderately heavy loads—both of these features are comprised in this engine. The British Society of Engineers have discussed the subject of steam carriages at great length in one of their recent meetings, and we cull from their report some accounts of what previous inventors have achieved, so that if our own people should take the matter in hand, they may not be ignorant of what has been heretofore attempted.

In 1824, W. H. James, of England, took out a patent for improvements in steam carriages, and several were constructed on his plan. He employed four cylinders, each pair coupled on to one driving wheel, the axle of which was divided in the middle; the object of this was to render each wheel independent of the other, and to avoid the necessity of throwing the inner one out of gear when turning curves, at the same time to allow both engines to be in motion. The motion of the springs was allowed for, by making the engines, and the frame in connection with them, vibrate upon hollow axles provided with stuffing-boxes, constituting the steam and exhaust passages. A few experiments were tried with these engines, during which, it is said, they attained a speed of twenty miles an hour. They were complicated, however, and were soon abandoned.

In 1826, Mr. F. Andrew patented a carriage, the steering apparatus of which is worthy of special mention; this consisted of a simple wheel placed in front of the carriage, revolving between two lateral bars of a framing; by guiding this wheel with a lever, the direction of the two fore wheels could be altered, thus turning the wagon in every direction. This carriage had oscillating engines, acting directly on the main axle, but the invention was a failure through a defective boiler.

The next candidate for fortune and renown was a Mr. Gurney, who, after repeated trials and failures, at last succeeded in establishing a line between Cheltenham and Gloucester, England. Mr. Gurney, like many others, commenced his experiments with a machine having a series of legs, which struck out behind in order to obtain the necessary adhesion; this plan was abandoned in favor of direct-acting engines, coupled on to the cranked axle of the after-drivers. There was also an upper and under framing, the engines being attached to the under one, while the boiler, passengers, &c., were carried by the upper one, the object of this arrangement being to keep the body of the carriage well suspended, while the engines always maintained their relative position with the axle. The proprietors ran these steam coaches for four months, four times a-day, between Cheltenham and Gloucester, during which time they carried 3,000 persons, and ran 3,500 miles at the rate of a little over nine miles per hour. They were, however, driven off by opposition, and the project was finally abandoned by Mr. Gurney.

We now come to Mr. Walter Hancock, of Stratford, who commenced his career in 1827. His carriages were much superior to any others hitherto constructed, both in point of workmanship and plan. The cause of failure in most of his predecessors lay with the boiler, and the one he adopted is said to have been remarkably ingenious, considering the state of the mechanic arts at that period. One of his coaches, called the *Infant*, had a boiler with six square feet of grate surface, and one hundred feet of upright surface. This supplied vapor to engines of 9-inch cylinder, and 12-inch stroke. The weight of the whole carriage was about six tons. He used an artificial draft, and, it is said, raised steam from cold water in twenty minutes. The following is a description of his invention:—In order to avoid twisting the main shaft, which was always breaking in other inventions, an endless chain was adopted in preference to direct action, and a vibrating link was placed between the engine shaft and the axle, to take the strain caused by the transmission of power, as also to preserve a uniform distance between the two parts. The driving-wheels were outside of the frame, ran loose on the axle, and connected with clutches, so that the stoker could throw them out of gear when desirable. The piston worked downwards, and the driving-axle and crank shaft were geared to the same speed. Hancock constructed nine engines of this pattern, which ran several months in public service, but he also was obliged to discontinue them through popular prejudice.

Coming down to later years (1859) we find that a Mr. Rickett, of Stony Stratford, England, has been quite successful, in a mechanical point of view, with his inventions. The main features of his carriage are the framing and the boiler; the former is hollow, and contains the supply of water for the boiler in addition to supporting the working parts; the boiler is very short, is made of steel, is nineteen inches in diameter, and affords an area of thirty-one square feet of heating surface. The cylinders are three inches diameter and nine inches stroke, and work at an average pressure of one hundred pounds. This carriage has run upwards of twelve miles an hour on common roads.

With these extracts we conclude. The meeting

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discussed at great length many other forms of steam carriages, among which was a plan for a street omnibus, which would carry thirteen persons besides the fireman and steerer. The objections to its use were novel, the principal one being that horses were unable to understand or rather comprehend the nature of a wagon that moved without any apparent means of propulsion. The exhaust steam was also a source of annoyance to horses which it was desirable to ~~a~~. This it was thought could be overcome by working the steam at ~~a high~~ pressure, and cutting it off short, thus diminishing its volume. The cost of working street carriages by steam, as compared with horse power, was also considered in balancing the merits of the two systems, and resulted by a small amount in favor of steam. The English roads and streets are so much better than ours, generally, that inventors in that country have not the same disadvantages to contend with as we have. Whether the steam wagon will ever supersede, to any extent, the employment of cattle is a question that remains to be solved. Years ago, he would have been a rash man who predicted the universal system of railroads that now twine almost every country on the globe as with a net. Who shall say, then, that when the difficulties and prejudices which now exist are overcome, what new schemes and inventions may not be inaugurated?

SINKING OF IRON CYLINDERS FOR PIERS.

The employment of cast iron cylinders for foundations in water, such as bridge and dock piers, has been tried in America to a limited extent, but with such satisfaction that in all likelihood their future use will be upon an extensive scale. They constitute an improved development of foundations laid by the diving-bell system. In 1779 the celebrated Smeaton first used the diving-bell for repairing the foundations of Hexham Bridge, in England, instead of making coffer-dams. The next good improvement was D. Potts's pneumatic process of sinking iron cylinders, which was illustrated on page 1, Vol. VIII, (old series) of the SCIENTIFIC AMERICAN. The principle of this method may be briefly stated as follows:—An iron cylinder to be sunk as one of the piles of the foundation is covered with an air-tight cap, placed in position, and allowed to sink through the water and soil; it is then connected by a flexible hose to a receiver, which is furnished with a trap valve in the bottom, opening downwards, and put in communication with a three-barreled air-pump. The pump is put in motion, and the air is exhausted from within the cylinder and receiver, the silt or sand is forced up in the reservoir by the external pressure of the atmosphere, and, as soon as the reservoir is filled, a valve at the bottom is opened and the contents allowed to flow out, after which the valve is closed and the operation repeated until the pile is sunk to the required depth. The cylinder sinks by its own weight and the external pressure of the atmosphere. The method is not available when applied to stony ground, as water would flow in under the edges of the cylinder and vitiate the external vacuum.

A plan the reverse of this, called Hughes's pneumatic system, has been employed for sinking the cast-iron cylinders of the new bridge at Harlem, near this city. This method consists in filling the cylinder with compressed air by which means the water is expelled from below the tube, and men excavate and work inside. In both of these methods, the cylinders used are plain castings; an air-tight trap hood being used on the top of each cylinder during the operations of excavating. Another method consists in forming each cylinder with a screw on its lower extremity, and giving it a rotary motion by which it is forced into the ground. In many situations this plan has been very successful. Another plan consists in forming each screw cylinder with a disc at its lower end, leaving a hole in the center through which a wrought-iron pipe is carried down through the pile, projecting some inches below its bottom. Water is forced down this pipe under pressure, and a rotary motion is given to the cylinder at the same time. This method has been found very successful in sinking such cylinders in very hard river bottoms.

THE number of applications for pensions made at the Pension Bureau at Washington, up to December 12th, this year, was 7,911.

WHAT A UNIT OF HEAT CAN DO.

In talking and writing about heat, physicists have felt the need of some mode of expressing a definite quantity, and the idea was suggested of calling that quantity which is sufficient to raise the temperature of one pound of water one degree of Fahrenheit's scale a *unit*. Having thus exactly defined a given quantity of heat, it is surprising to find how many truths in relation to the action of caloric may be briefly and clearly expressed, which before, it was difficult to comprehend and convey. It is an impressive illustration of the value of accurately defined terms in scientific discussions.

Specific heat, for instance, may be explained in a very few words by the medium of units. A unit of heat will raise the temperature of a pound of water one degree, but it will raise the temperature of a pound of mercury 33°, and of a pound of tin 20°. Or, it takes one thirty-third of a unit of heat to raise the temperature of a pound of mercury one degree. We accordingly say, that the capacity of mercury for heat or its specific heat is one thirty-third, or three one hundredths, expressed decimally 0.03, and that of tin is 0.05.

A clear idea of *latent heat*, also, may be very briefly conveyed by means of units. To raise the temperature of a pound of water from 60° Fah. to 212° the water must absorb 152 units of heat; then it will absorb 1,000 units more without raising its temperature at all, but these 1,000 units convert it into steam. As this heat which changes the water from the liquid state to that of vapor does not show itself either to the touch or when tried by the thermometer, it is called hidden or latent heat.

A unit of heat applied to *mechanical effort* will raise 772 pounds of matter one foot; in other words, it will perform 772 foot-pounds of work.

As it takes more heat to raise the temperature of water one degree at some temperatures than it does at others, it was necessary to fix some temperature at which the measure should be taken, and 60° Fah. has been agreed upon; water at that temperature being easily obtained.

THE CHANGES OF A PIECE OF SILVER.

If we place a piece of pure silver in nitric acid and add a proper quantity of water, the silver is dissolved as completely as sugar is in water, and wholly disappears; the solution looking exactly like pure water.

If now we evaporate a portion of the water and set the solution away, we shall find in the course of a few hours that the bottom of the vessel is covered with beautiful, white, flat plates, which are crystals of nitrate of silver, the metallic silver in combination with nitric acid. The nitrate of silver has some very singular properties. If kept free from contact with other substances, it may be exposed to the light for any length of time without any change from its pure white color. Or it may be applied to cotton or the skin or hair in the dark without any change in color. But if it is applied moist to any vegetable or animal substance and exposed to the light, it turns black in a few minutes. It is the coloring agent in indelible ink.

If we place crystals of nitrate of silver in water, they are quickly dissolved, and if we throw a little table salt—the chloride of sodium—into the solution, the silver leaves the nitric acid, and combines with the chlorine in the salt, forming the chloride of silver. This is a white lustreless powder, and gradually turns black when exposed to the action of the light. Metals may be silvered cold by means of the chloride of silver.

If we mix chloride of silver with carbonate of soda, and heat the mixture in a crucible to a very bright red, it is dissolved, and both of the substances are decomposed. The chlorine leaves the silver and combines with the sodium of the soda, forming chloride of sodium—table salt—the carbonic acid escapes as a gas, and the silver is left in the metalic state in the bottom of the crucible.

Thus we have silver first as a white solid metal, then a liquid like water, then in crystals like salt, then as indelible ink, then as a gray or black powder, and finally again as a metal. And these are only a very small part of the forms which it may be made to assume.

GENERAL BURNSIDE'S LETTER.

General Burnside has written a letter to President Lincoln in reference to the late disaster at Fredericksburg, in which he most characteristically and magnanimously assumes the whole responsibility of the occurrence. "The pen is mightier than the sword," and in this respect the General has shown himself the greatest soldier of the war. We cannot recall, at this writing, any other case of a like nature, in which the commanding officer so nobly and generously bared his own forehead, and laid himself open to whatever criticism might be visited upon him. In speaking of the honored dead who fell upon that day, fighting superhumanly, the General conveys to those who mourn, the assurance, at least, that he also, being a man, grieves with them and shares their sorrow. Our losses, says the same authority, have been as usual, greatly overated. They amount to 1,152 killed, with about 7,000 wounded; we also took 700 prisoners, which last have been paroled. The retreat—which seems to have been carried out only after the enemy refused to leave their intrenchments and attack us—was a masterly affair, and was executed without loss. The President, in acknowledging this letter, has issued an address to the army under General Burnside, in which he congratulates them upon their valor and endurance, and assures them that although they were unsuccessful, the attempt was not an error, nor was it anything but a pure accident. Well may Mr. Lincoln thus eulogize our brave men; surely a cause that has such hearty supporters was not born to die. In common with most of the Northern people we were overwhelmed, at first, when the news and extent of our disaster reached us, but we feel like adopting the backwoodman's advice to his comrade when his rifle missed fire, *i. e.* to "pick the flint and try her again." And this is just what the North will do. No lawful means will be left untried to secure those rights and privileges for which we are fighting and which we properly deem inestimable; without these life itself is valueless.

PAPER FOR SHIP-BUILDING.

Much has been said and written about "the wooden walls of old England," meaning thereby the war-ships of that nation; but, from late experiments, we judge they are not quite so good as paper. The special Government committee that was appointed to make experiments with guns and iron-clad targets—the latter representing the side of a ship—deserve credit for developing many new facts connecting with the power of resistance possessed by various materials, and the penetrating powers of others. Thus it has been found that steel and wrought-iron shot will penetrate plates which break cast-iron shot like glass. A target was constructed entirely of iron, under the impression that it would prove superior to one composed of wood and iron combined; but it was found inferior, owing to the greater amount of vibration induced by the shot striking. Hard wood, especially teak, was supposed, until lately, to be the best backing material which could be employed for the iron plates; but, strange to relate, it has been found by experiment to be inferior to paper. Two targets were lately constructed with one-inch plate-iron—the one backed by fourteen inches in thickness of teak-wood, the other backed by the same thickness of paste-board. They were fired at with a Whitworth 6-pounder, using elongated shot 5½ inches in length, and 2½ in diameter, and the penetration was found to be twice as great in the timber-backed target that it was in the paper one. The targets were then fired at with a 12-pounder, and with like results. The resistance of paste-board to shot has attracted so much attention on the other side of the Atlantic that further experiments are to be made with it. A denser and tougher material than wood can be made of straw and cornstalk paper. Who knows but the seas may yet be navigated in paper ships?

POMPEIAN window-glass, of which panes have been discovered as large as 20 by 28 inches, has proved, on examination, to have been cast in a manner similar to that now followed in making plate-glass, except that it was not rolled flat, as now, by metal cylinders, but pressed out with a wooden mallet, so that its thickness is not uniform.

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LITERARY NOTICES.

DIGEST OF AMERICAN CASES RELATING TO PATENTS FOR INVENTIONS AND COPYRIGHTS, FROM 1789 TO 1862. By Stephen D. Law, Counsellor at Law, No. 52 John street, New York.

This is a handsome and large volume, containing a digested abstract of all the American cases, so far as they could be obtained, relating to patents for inventions, copyright and trade marks. It owes its origin to a want (experienced by its author) of some work containing a summary of the statute law and decisions of the courts in relation to patent cases. There are no less than eight hundred and thirty-four cases digested, and seven hundred and thirty-four of these have reference to patents for inventions. Of such cases about four hundred are to be found in the reports of the Supreme and Circuit Courts of the United States, contained in more than one hundred volumes, fifty cases from various law periodicals, and eighty are manuscript cases. All sources of information on American patents have been examined, such as decisions of the justices of the Circuit Court in Washington, on appeals from the Commissioner of Patents, &c., &c. Mr. Law has been very painstaking and laborious in preparing this work, and he has arranged the information in a most convenient manner for reference. It is not a mere dry digest, for all the most important points are carefully dwelt upon, so as to present correct and satisfactory information in relation to them. The decisions on particular patents are arranged in classes—those on reaping machines in one group, those on sewing machines in another, and so for all the patents, according to their specific character. It is the most valuable contribution to American patent laws that has yet been published, as a work of reference and reliable authority. The author deserves the thanks of the profession for his rich and valuable work.

MANUAL OF GEOLOGY. By Prof. James D. Dana, M.A., LL.D. Published by Theodore Bliss & Co., Philadelphia.

This is a much-desired volume, which supplies a want long felt by students of American geology. It is intended for the use of colleges, academies, and schools of science, as well as persons devoted to literature. It is illustrated by a chart of the world and over one thousand figures, mostly from American sources, it having special reference to American geological history. Its author is Professor of Geology, &c., in Yale College. American geology is written out by itself as a continuous history, and we have here presented a natural history of the earth—its continents, seas, climates, and life. The style of the author is not only instructive, but graceful and attractive.

Geology has become a most instructive and interesting science. In its survey of the earth science has recognized three kingdoms of nature, namely, the animal, vegetable, and inorganic or mineral. According to geology, the earth has been brought to its present condition through a series of changes or progressive formations, and under the guidance of the Almighty it has passed through a regular history, or growth, in seas and lands, rocks and mountains, in the physical conditions of heat and moisture, and in vegetable and animal life. As a historical science, geology finds strata of granite, sandstone, clay-rock, and limestone lying above one another in many successions; and it assumes that the sandstones were made of sand by some slow process, clayey rocks of clay, and that these were successively formed and belong to successive periods of the past, the lowest bed in a series being the earliest. Geology, therefore, infers that the character of each rock indicates some facts respecting the condition of the sea or land during the period of its formation. The rocks are, therefore, regarded as records of successive events in the history of the earth. Every rock marks an epoch in the earth's history; groups of rocks, periods; and large groups, ages; and the ages reaching through geological time are represented by the rocks that extend from the lowest to the uppermost series. A fossil shell, coral, bone, or leaf, found in one of the beds of rocks, is a record of some species that existed when that rock was forming, and it tells a tale of life of that epoch. By studying the character of these remains of past ages, geologists and paleontologists restore the populations which have succeeded one another on the earth. Like the scholar who has studied the hieroglyphics and cuniform characters on the tombs of Egypt and Assyria, and deciphered the history of past ages, so the geologist has constructed his alphabet of fossils, and given us the testimony of the rocks to the history of our planet in ages long before man raised a monument or wielded a pen. Geology has, therefore, become a most deeply interesting science to all men, and in this volume of Professor Dana we have the best work of the kind yet given to the public.

EMPLOYMENT FOR WOMEN. By Miss Virginia Penny. Published by Walker, Wise & Co., Boston, Mass.; and may also be obtained at Room 44, Bible House, this city.

To find out suitable channels in which women might successfully exercise their talents, hands, and brains has long been a subject of inquiry among philanthropists generally. So few branches have been hitherto known in which they could compete with men, that their sphere of usefulness has been somewhat restricted. We are not of those who believe in confining women to teaching, shop-tending, or a few of the simple avenues of trade which has been their walk heretofore. In most of the manual, mental, and mechanical operations of the day our sisters now compete with us; and we think it will prove a surprise to many men when they are told that out of five hundred and thirty-three articles which the book in question contains, more than five hundred are descriptions of work in which women have, or may be, engaged. The work also gives the average prices paid for labor, for board in the various towns of the several States, and furnishes, in brief, a compendious account of information upon this subject which would be otherwise unattainable.

RECENT AMERICAN INVENTIONS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week. The claims may be found in the official list.

New Mode of Operating Railroad Pumps.—This invention consists in the application of steam from the locomotive boiler to operate the piston or pistons of one or more steam cylinders which connect by suitable mechanism with the plunger of a railroad pump, in such a manner that whenever the locomotive arrives in the neighborhood of a pump, and when it is desired to throw water into the tender or into a tank situated at the side of the track from which it can be let down into the tender, this object is effected by connecting said steam cylinder or cylinders with the locomotive boiler, thereby operating the pump by steam power instead of the ordinary slow process of operating the pump by hand. Gilbert M. Cole, of Folsom city, Cal., is the inventor of this device.

Knitting Machine.—The principal object of this invention is to provide for the easy insertion and removal of the needles of a circular knitting machine, and to this end it consists mainly in a peculiarly constructed grooved conical needle plate and a peculiarly applied needle-operating ring, working in combination with such needle plate. The inventor of this knitting machine is W. B. Evans, of Holderness, of Grafton, N. H,

Cartridge-tearer.—This device is composed of two horns and an interposed fleam-like tooth to be attached to the barrel of the gun, near the muzzle, the horns being for the reception of the folded end of the cartridge between them and the fleam-like tooth being for the penetration and tearing of the paper while it is confined between the said horns. Daniel Kelly, of Grand Rapids, Mich., is the inventor of this device.

THERE is now exhibiting on the Boulevard Magenta, at Paris, the figure of a woman so constructed as to sing various songs. A tube of india-rubber represents the larynx; the voice has a compass of two octaves. The inventor is Mr. Faber, formerly a professor of mathematics in Germany.

COPPER cents, nickle cents and three-cent pieces are all of much less intrinsic value than the sums they represent, and people will make nothing by hoarding them.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING DECEMBER 16, 1862.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

37,146.—Knapsack Collar.—J. E. Atwood, Washington, D. C.:

I claim the use of a stiff leather collar constructed as described, when combined and arranged in the manner set forth, with a knapsack.

37,147.—Cider Mill.—P. J. Berlin, Blairsville, Pa.:

I claim the arrangement of the stripper, D, oscillating lever, l, spring lever, m, and crushing rollers, d d′, with the wiper, m, and master wheel, in the manner herein shown and described.

[The object of this invention is to combine on the same platform an apparatus for crushing apples, &c., operated by means of a horse-power, and a device for pressing the crushed apples or other fruit, said platform being supported on sleigh runners, in such a manner that the whole cider mill can be readily moved from place to place and operated wherever it may be put up.]

37,148.—Grain Separator.—Murrin Burr, Plymouth, Mich.:

I claim the arrangement of the horizontally-vibrating shoe, D, and the screen, L, having an independent, vertical, reciprocating movement, for the purpose of agitating it sufficiently to discharge the foul seed and to prevent it from choking, as herein set forth.

In combination with the screen, L, I also claim the segments, M M, or their equivalents, pivoted to the shoe, and having shanks, i i, resting in sockets of retaining cross pieces, P P, for the purpose of giving a reciprocating vertical movement to the said screen, with the horizontal vibrations of the shoe, substantially as herein specified.

I also claim the arrangement of the double-inclined spout, R, spaces, r r, between the shoe and walls of the mill, and seed receptacle, v, so arranged as to discharge the foul seed around the lower screen, U, and collect it, substantially as herein described.

I also claim the arrangement of the screen, U, ledges, t t, segments, M′ M′ or equivalents, and blocks, s s, arranged in connection with the shoe, D, and walls, B B, of the mill, as herein specified.

37,149.—Combined Shoulder Brace and Suspenders.—D. W. Canfield, New York City:

I claim the combined shoulder brace and suspenders, composed of the shoulder straps, A A, back straps, C C, front straps, D D, and end pieces, a a and c c, the whole arranged and combined as herein set forth.

[This invention consists in a novel mode of arranging and combining the several straps and pieces of which the combined shoulder brace and suspender is composed, whereby it is made to serve as an effective shoulder brace, and to support the pantaloons or other garment with greater ease and comfort to the wearer than with the arrangements of parts in common use, and is rendered more perfectly adjustable.]

37,150.—Attaching Handles to Knives.—Matthew Chapman, Greenfield, Mass.:

I claim the flat tang, C, of the implement, provided with a V-shaped notch, a, at its end, in combination with the rivet, D, and the slot, b, in the handle, B, provided with a projection, c, at its bottom, of such a shape as to fit into the notch, a, of the tang, substantially as and for the purpose herein specified.

[This invention consists in having the handle of the knife or other article slotted longitudinally a certain distance from its inner end, and having the knife or other article provided with a flat tang, equal in length to the slot, the end of the tang having a V-shaped notch made in it, and the end of the slot provided with a corresponding shaped projection, which fits in the notch in the tang, when the latter is inserted in the slot in the handle, the above parts being used in connection with a rivet which passes through the handle and tang.

37,151.—Grinding Mill.—J. M. Clark, Lancaster, Pa.:

First, I claim the mode substantially as described of attaching the cross-tie, r, and lever, E, to the hoop, d, for the purpose specified.

Second, I claim a revolving grain cup or disk, H, having couplings or lugs, h′, and an attached tube, r6, in combination with the rhine, e.

Third, I claim applying to millstones a silent feed which is not affected by the act of setting the stones to grind either coarse or fine, substantially as described.

Fourth, I claim suspending the revolving cup or disk, H, from the cross-tie, r, by the tube, r8, or its equivalent, in the manner and for the purpose set forth.

Fifth, I claim suspending the stationary grain guard, H′, over the eye of the stones, and so that it may be removed therefrom with the cross-tie, r, for the purpose set forth.

Sixth, I claim the combination and arrangement of the lever, E, cross-tie, r, and hoop, d, substantially in the manner and for the purpose set forth.

Seventh, I claim the combination of the feed-lever rod, m′, and rod, m2, substantially as and for the purpose set forth.

Eighth, I claim operating an alarm and also an indicating apparatus, by means of a shaft which receives motion directly from the central portion of the mill-stone "runner," for the purpose specified.

Ninth, I claim the combination of the alarm apparatus and the indicating apparatus with the centrally-located shaft, i2, substantially as described, for the purpose set forth.

Tenth, I claim a lighter staff, j, in combination with the screw shaft, m, substantially as described.

Eleventh, I claim the head blocks, l l2, whether stationary or adjustable, in combination with the "way," L, substantially as described, for the purpose set forth.

Twelfth, I claim applying to the bell shaft, K′, a belt arm, x5, and bell, B′, which, by their centrifugal action, effect the alarm, in conunction with head blocks, l and l 2 or their equivalents, substantially as described.

Thirteenth, I claim in a bell which constitutes a part of a centrifugal governor, so hanging the "clapper" on a pivoted spring-arm, that it has unobstructed freedom to move back and forth in the line of rotation of the bell, against the inner side of the bell, but is prevented from coming in contact with the bell in a direction at right angles thereto, substantially as described.

37,152.—Mode of operating Railroad Pumps.—G. M. Cole, Folsom City, Cal.:

I claim the application of one or more cylinders, D, which are supplied with steam from the locomotive through pipes, c c′, in combination with the pump, B, as and for the purpose shown and described.

37,153.—Expanding Bedstead.—Nelson Cross, New York City:

I claim the combination of the side and cross levers or bars with the canvas top or bed piece, as and for the purpose aforesaid.

37,154.—Straw and Grain Separator.—A. B. Davis, Philadelphia, Pa.:

I claim, first, Separating the straw from the grain in threshing machines by means of a series of rocking rakes, arranged in respect to and operating in unison with each other, substantially as set forth.

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Second, Imparting the desired motion to the said rocking rakes by means of reversed racks, arranged on a reciprocating frame, in relation to pinions on the shafts of the said rakes, substantially as set forth.

37,155.—Air Engine.—William Denkmann, Washington, D. C.:

I claim, first, The use of a plurality of separate heating chambers, operating successively in connection with each working end of the driving cylinder, K, substantially as set forth, to admit of heating the air in a longer time at which it is used.

Second, An air pump, L, employed in combination with heating chambers, substantially as set forth in the foregoing claim, to supply said chambers successively with cold air.

37,156.—Tourniquet.—Jacob Dunton, Philadelphia, Pa.:

I claim the combination of the adjustable slotted plates, A A A' A', screws, F F' and straps, G G', as set forth.

[This tourniquet is adjustable to suit limbs of any size, and is adapted to arrest arterial circulation, without interfering with that of the veins.]

37,157.—Wave Propeller for Shallow Water.—J. B. Eads, St. Louis, Mo.:

I claim providing light-draught vessels with a chamber, in which the propeller works when said chamber is filled with water by atmospheric pressure, to a hight above that of the water in which the vessel floats, for the purpose and in the manner substantially as herein described and represented.

37,158.—Riding Stirrup.—R. N. Eagle, New York City:

I claim first, Giving any desired longitudinal, lateral, or oblique inclination to the tread of a stirrup (with arms of equal length or with the inner arm the shorter), by means of the location given to the point of suspension, substantially as hereinbefore described.

Second, A metal cap or its equivalent employed to connect the arms of a stirrup, and constituting the means of attaching the suspending straps, and for confining the upper part of the cover, when one is used.

Third, A cover composed of two or more pieces of leather or its equivalent, and applied substantially as hereinbefore described.

Fourth, The combination of the rawhide or pelt with the frame or body of a stirrup, substantially as and for the purposes specified.

Fifth, The arrangement of the shaft, H, in inclined positions, as represented in Fig. 6, and described, for the purposes specified.

Sixth, The combination of an adjusting suspension with a stirrup or its cap, substantially as and for the purposes set forth.

Seventh, Giving to the sides or arms of a stirrup, whether of wood or other material, an oblique direction in front, and a perpendicular direction or line in rear, substantially as represented in Fig. 4, or the converse or described equivalent thereof, for the purpose specified.

37,159.—Centrifugal Gun.—G. C. Eaton and S. W. Turner, Cleveland, Ohio:

We claim, first, The stirrup, I, and bridge tree, I', in combination with the plate, G, and turn-table, G', arranged as specified, for the purpose of giving horizontal range to the ball.

Second, We claim the turn-table, G', in combination with the articulation, K' K'', for the purpose set forth.

Third, We claim the frame, M M', in combination with the articulation, K' K'', for giving altitude to the projectile, as specified.

Fourth, We claim the arms, T T', operating in concert within the frame, M M', for the purpose specified.

Fifth, We claim the stops, g h, operated as and for the purpose set forth.

Sixth, We claim the clutches, p, and weighted lever, p', in combination with the cam, W, arranged and operating as and for the purpose specified.

37,160.—Apparatus for teaching Military Tactics.—W. S. Engle, Brooklyn, N. Y.:

I claim the employment or use of the military figures or pieces, representing privates and officers pertaining to a battalion or regiment, for the purpose herein specified.

[This invention consists in the employment or use of military figures composed of rectangular blocks representing companies in line, and detached figures representing officers and privates, whereby a learner may practice all the movements of the privates and officers, both in battalion and company drills.]

37,161.—Knitting Machine.—W. B. Evans, Holderness, N. H.:

I claim, first, The combination of the needle plate, A, having its face composed of two conical surfaces, b c, and cylindrical surface, d, and needle grooves, e e, opening into the said cylindrical surface, and the two rings, B C, having between them an open space, s s, opposite to the openings of the grooves in said cylindrical surface, substantially as and for the purpose herein specified.

Second, The plate, L, applied in combination with the said needle plate and the ring, B, substantially as and for the purpose herein specified.

Third, The inclined surfaces, g' g', provided on the ring, C, substantially as and for the purpose herein specified.

37,162.—Machine for Threshing and Hulling Clover Seed.—G. W. Fosdick and John Crawford, Dowagiac, Mich.:

We claim the arrangement of the threshing cylinder, D, concave, C, picker, R, apron, E, screen, F, and pendants, f, with the carrier, G, in the manner herein shown and described.

The combination of the parts above mentioned, when arranged in the manner stated, with the apron, H, hulling cylinder, I, shoe, L, fan, P, and elevator, N, as herein shown and described.

The arrangement of the apron, H, and boards, m K, with the concave, J, cylinder, I, and shoe, L, in the manner herein shown and described.

[The object of this invention is to obtain a machine by which clover seed may be threshed from the straw, and the latter separated from the heads, and the seed also separated from the hulls—the whole operation being performed simultaneously, and the work done in a perfect manner.]

37,163.—Iron Bedstead.—J. M. French, East Cambridge, Mass.:

I claim the improved bedstead as made not only with its angle iron rails, B B, and head and foot frames connected by tenons and mortises, but with each of the said rails furnished with bearers, e e, constructed and arranged with respect to the tenons and mortises, and the lower bars of the head and foot frames, in manner and so as to operate therewith, substantially as specified.

37,164.—Lock for Mail Bags.—W. W. Gingrich and C. S. Coates, Mexico, Pa.:

We claim the arrangement of the jaws, A B, the plates, E D, and the springs, s m i and o, the several parts being constructed and used for locking the mouth of the bag at several points at one time, as herein fully set forth.

37,165.—Gearing for Machinery.—S. P. Gary, Oshkosh, Wis.:

I claim the combination of the stationary wheel, B, with the revolving wheel, C, the joint, G, and the crank, H, for the purpose of transmitting rotary motion from the shaft, D, to the shaft, E, or the reverse, substantially as herein set forth and described.

37,166.—Cultivator.—H. J. Heaton, Peoria, Ill.:

I claim the arrangement of the sliding bars, C C', draught-pole, D, bar, E, and lever, F, in connection with the frames, J J, having the plows, P, attached, all arranged as and for the purpose herein set forth.

[This invention relates to an improved cultivator of that class in which adjustable or laterally sliding shares or teeth are employed. The object of the invention is to obtain a cultivator of the class specified, which will enable the operator or attendant to have more perfect control over the implement than hitherto, so that the shares or teeth may be readily adjusted and made to plow up to the plants and follow the sinuosities of the rows however crooked or curved they may be.]

37,167.—Apparatus for Distilling Alcohol.—P. L. Howlett, Springfield, Ill.:

I claim, First, the arrangement of one or more heating tubes, i, in the extractor, B, in combination with the still, A, and doubler, C, constructed and operating substantially as and for the purpose specified.

Second, The arrangement and combination of the compartments' f g h, in the extractor, B, pipes, a and b, heating tubes, i, still, A, doubler, C, worms, c and m, troughs, D and F, and pump, E, all constructed and operating as and for the purposes shown and described

[An engraving and full description of this apparatus will be found on page 289, Vol VII. of the Scientific American.]

37,168.—Water Motor.—Daniel Hunsicker, Laurelton' Pa.:

I claim the endless chain provided with hinged floats and arranged to work over a rotating block, substantially as described.

And in combination with the endless chain and floats, I claim the guide rollers, M M, and guide pieces, N and P P, for the purposes set forth.

37,169.—Skate.—Benjamin Irving, New York City:

I claim as an new article of manufacture an improved skate, the runner or shoe of which is made of a plate of steel, with a narrow groove near each edge, when the body or frame of the skate is made of iron or some other softer metal or material, and when said frame is adapted equally to either foot as herein described.

37,170.—Machine for Punching and Eyeletting Shoes, &c.—Jeremiah Keith, New Bedford, Mass.:

I claim my improved punching and eyeletting machine, the same consisting of the vibrating hopper or eyelet magazine, C, the inclined director, D, the eyelet retainer, E, the rotary punch, L, and upsetter, L2, the rotary punch bed, t, and the eyelet separator and carrier, u, the whole being constructed and made to operate substantially as set forth

I also claim the combination of the rotary punch, L, and upsetter, L2, with the rotary punch bed, t, and the eyelet separator, u, the same being arranged substantially as set forth.

I also claim the combination of the magazine, C, the conductor, D, the retainer, E, the revolvable eyelet separator and carrier, u, and the upsetter, L2, the same being arranged and made to operate as set forth.

37,171.—Cartridge-tearer for Muskets.—Daniel Kelly, Grand Rapids, Mich.:

I claim a cartridge-tearer composed of a ring or band with two horns, a a, and tooth, c, between the horns; said horns, tooth and ring being all made in one piece and operating as herein set forth.

37,172.—Claw-bar.—Isaac Lamplugh, Peoria, Ill.:

I claim the shifting fulcrum arm, E, having an auxiliary bearing point, d, in combination with the slot, b, recess, a, and the heel, H, in the manner and for the purpose substantially as described.

37,173.—Air Guns.—Edward Lindner, New York City:

I claim, first, The formation of a lever constructed conformably in shape with the handle or stock of the gun or pistol, and so arranging and combining with it a piston and spring as to compress the latter by direct action on the piston rod, substantially as herein shown and described.

Second, The combination with a cylinder in which the air is compressed as described, of a piston with an automatically expanding packing as herein shown and set forth.

Third, The formation of an annular recess at the joint of the barrel with the breech in combination with a projecting india-rubber ring, whereby an air-tight joint is effected substantially as herein described.

Fourth, Providing the cylinder containing the air-compressing piston with an aperture and slide valve, or any other equivalent means of adjusting the size of the said aperture, to regulate the size of the vent or the force of compression as herein described.

Fifth, The construction of the projectiles with an elastic and expanding back or bottom whereby in air pistols or guns rifled barrels may be used to insure accuracy of aim as herein described.

37,174.—Ash-sifter.—William McConnell, Philadelphia, Pa.:

I claim, first, A hopper, A, of any suitable form, provided with the lid, a, or its equivalent, and sieve, b, when the whole is so connected to a permanent bracket, B, or its equivalent, as to be readily vibrated.

Second, I claim, in combination with the vibrating hopper, a curtain, D, of such shape and dimensions as to inclose the mouth of the receptacle for the ashes without interfering with the free movement of the hopper.

37,175.—Post-mark and Cancelling Stamp.—M. P. Norton, Troy, N. Y.:

I claim, first, The cancelling device, C, having on the face or lower surface thereof knives or cutters, and a guard or guards in combination with each other, by means of which the postage stamp is cancelled by the said cutter, and at the same time prevent any injury to the letter or any contents therein from the said knives or cutters by means of the said guard or guards, substantially as herein described and set forth.

Second, I also claim the combination of the cancelling-stamp, C, and the post-marking or rating-stamp, D, with the cross-piece, B, substantially as and for the purpose herein described and set forth.

37,176.—Earth-scraper.—Nelson Peck, Jay, N. Y.:

I claim the combination of the scraper, C, draught-pole, D, axle, A, and levers, E E E, all arranged to operate substantially as and for the purpose herein set forth.

[This invention relates to a new and improved earth-scraper designed for repairing roads and for general grading purposes. The invention consists in a novel and improved combination and arrangement of the scraper-wheels, draught-pole and levers, whereby the scraper may with the greatest facility be raised or lowered—lowered to perform its work and elevated to discharge its load.]

37,177.—Pantographic Engraving Machine.—Benjamin L. Phillips, Providence, R. I.:

I claim, first, The method of communicating the motions of the tracer-point, a, and carriage, E, to the cylinder, C, substantially as described.

Second, Supporting the bars, T, on fixed inclined ways, S, substantially as and for the purpose set forth.

Third, A compensating connection between the weighted arm, g2, and graver arm, c2, substantially as described.

Fourth, Pivoting the weighted arm, g2, at a different point from that at which the graver arm, c2, is pivoted, that they may be moved separately, substantially as described.

Fifth, The inclined groove, 8, for guiding the graver carriage substantially as described.

Sixth, Inclining the bar, F, for the purpose specified.

Seventh, Changing the relative speed of the carriages, E and G, by connecting them with pulleys of a different size, substantially in the manner and for the purpose set forth.

Eighth, The automatic feed connected with the pulley, E2, for regulating the spaces between the grounding lines substantially as described.

Ninth, The employment of screw-scored pulleys such as, W E2 C2, on a pantographic engraving machine, for the purpose specified.

Tenth, The employment of templets cut out to the form of any figure which is to be repeated, in combination with a supplementary tracing-point, a3, to be used substantially as set forth.

Eleventh, Reversing the motions of the graver carriage by clamping the wire, x, to the carriage, G, either at a1 or a2.

37,178.—Horse-power.—William Pierpont, Salem, N. J.:

I claim, first, The combination of the socket pieces, a, and lever supporting piece, b, with the main wheel, A, substantially as and for the purpose set forth,

Second, The combination of the draft levers, B, with the braces, C, and main wheel, A, substantially as set forth.

37,179.—Head Block for Lasts.—C. F. Pollard, Lynn, Mass.:

I claim, first, The plates, B E F, notched flange, C, with the wedge, D, spiral spring, d, and pin, b, when combined and arranged to operate in the manner and for the purpose specified.

Second, The sliding toe rest, K, pivoted catch, p, in combination with the inclined plane, I, notched bar or rack, m, curved spring, n, and pivoted lever, H, when arranged to operate in the manner and for the purpose specified.

[This invention consists in a peculiar manner of attaching the table supporting the heel and toe rest to the pedestal, whereby the last may be easily and expeditiously adjusted to any desired angle or inclination; also in an arrangement of sliding toe rest which admits of long or short lasts being used without materially changing its inclination.]

37,180.—Belt-shifting Device.—William Sellers, Philadelphia, Pa.:

I claim the use of an internal and external segment wheel arranged substantially as and for the purpose specified.

37,181.—Elastic Cups, Dippers, &c.—Thomas Smith, Boston, Mass.:

I claim the improvement in the manufacture of elastic or semi-elastic vessels, which consists in so forming them as to cause them to engage and be firmly held in a band or bands of metal or other rigid material, substantially as described.

37,182.—Apparatus for Steaming Oysters in the Shell.—Isaac Solomon, Baltimore, Md.:

I claim, first, The combination and arrangement in an apparatus for steaming oysters of the receiver, a' a' a' a', constructed substantially as described, with the steam supply pipes, valve and perforated shelf tubes constructed and arranged for conjoint operation in the manner set forth.

Second, In an oyster-steaming apparatus, the combination of the steam-tight doors, A, constructed and operating substantially as set forth, with the air valves, F, and steam-escape valve arranged and operating as and for the purpose described.

Third, The employment in an oyster-steaming apparatus of a receiver at the bottom for the reception and preservation of the liquor from the oysters to be drawn off for use as described.

37,183.—Spring Fastening for Lamp Chimneys.—W. S. Thompson, Rochester, N. Y.:

I claim securing the chimney by means of the flexible, elastic wires, D D, on the opposite sides, suitably connected together, and having the portions, c c, resting respectively in the slots, a a, of the flange of the lamp top, in such a manner as to furnish an extended, continuous bearing on the base of the chimney to hold it centrally in place and allow it to expand freely and to adapt it to different sized chimneys, the whole arranged, combined and operating substantially as herein set forth.

37,184.—Seeding Machine.—Morris Todd, Quasqueton, Iowa.

I claim the arrangement of the vertically adjustable hopper-box, A, suspended by means of straps or pendents, B, from the hind axle, E, of an ordinary wagon in combination with the gauging screen, c, and hinged bottom, G, all constructed and operating in the manner and for the purpose shown and described.

[This invention consists in the arrangement of a vertically adjustable hopper box suspended by means of suitable straps or pendents from the axle of the hind wheels of an ordinary wagon and provided with a hinged adjustable bottom in combination with a guage screw in such a manner that said hopper can easily be adjusted to suit wagons of different hight, and the bottom can be set to sow different seeds or different quantities of seed per acre by means of the guage screw, which is provided with a suitable scale to indicate the quantity of seed sown per acre for different positions of the hopper bottom.]

37,185.—Amalgamator for Gold and Silver.—Thomas Varney, San Francisco, Cal.:

I claim, first, The employment or use of a rotating muller, F, provided with central openings, g, and arranged within a pan or tub, A, with a stationary muller, G, or an equivalent bed-plate, substantially as shown, to insure a current or circulation of the pulp within the pan or tub and between the mullers, as and for the purpose set forth.

Second, A covered or close pan or tub, A, composed of two parts, a b, connected together, when said pan or tub is used for an ore amalgamating device as specified.

Third, The curved plates or scrapers, I, arranged to operate in connection with the rotary muller, F, for the purpose herein set forth.

[This invention consists in the employment or use of a rotary and stationary muller placed within a suitable pan or tub provided with a cover, and arranged in such a manner that when the device is in operation the ore will pass in a current or stream outward from the center and between the mullers to the circumference of the same and thence inward over the upper and rotating mullers to the center of the same; and down through said muller between it and the lower stationary one to be again thrown to the periphery of the mullers, thereby causing all the particles of the ore to be brought in contact with the quicksilver in the pan or tub or with the amalgamated plates attached to the muller or mullers. The invention also consists in the employment or use of curved or spiral scrapers placed within the pan or tub and arranged relatively with the upper surface of the rotating muller in such a manner as to insure the passage or movement of all heavy substances in the pulp, thereby preventing the same from lodging on the rotating muller.]

37,186.—Steam Engine.—Henry Walters, Tamaqua, Pa.:

In cylinders of steam engines of otherwise ordinary or suitable construction, I claim valves at either end of said cylinder and balanced by a working beam so as to automatically open and close the water passages by the alternate action of steam on the piston as described, when the fulcrum of said beam is adjustable, whereby the lift of the valves may be regulated at pleasure substantially as herein shown and set forth.

37,187.—Harvester.—David Warren, Gettysburg, Pa.:

I claim the springs, A1 and A2, the bolt, e, and the guide, B, the whole arranged in the manner and for the purpose herein specified.

37,188.—Self-feeding Sawing Machine.—T. J. Wells, New York City.

I claim the combination of the saw, A, with the table, E, and guide, F, when arranged in relation to each other, and operating in the manner and for the purpose described.

37,189.—Mode of Punching Countersunk Holes.—J. V. Westlake, St. Louis, Mo.:

I claim the punching of countersunk holes in metal so that the same shall be applicable to the practical use of receiving the taper or inverted cone-shaped heads of bolts and other like fastenings, substantially as described.

37,190.—Furnace for the Manufacture of Oxide of Zinc.—Joseph Wharton, Philadelphia, Pa.:

I claim, first, The trough, T, and trunk, E, for introducing water into the furnace for the purpose of cleaning the zinc oxide while in the furnace and at the instant of its production, substantially as above described.

Second, The arrangement of the furnace, A and B, the division wall, c, and the reverberatory arch or cover, substantially as shown.

37,191.—Rocking Sled Propeller.—John Wiarda, Hoboken, N.J.:

I claim, first, The arrangement of one or more pointed feet, d d, in combination with the rocking seat, A, of a sled, constructed and operating as and for the purpose shown and described.

Second, The arrangement of working beams, F, in combination with the hinged pointed feet, e e, and with the rocking seat, A, and footboard, b, of a sled constructed and operating substantially as and for the purpose specified.

[This invention consists in the arrangement of one or more pointed feet hinged to the under surface of the rocking seat of a sled, suspended from a pivot or pivots in such a manner that by imparting to said seat an oscillating or rocking motion the feet are alternately depressed on the ground in an inclined direction so as to propel the sled, and raised for a fresh hold and thereby a considerable velocity can be imparted to the sled with a comparatively small exertion of the person or persons occupying the seat.]

37,192.—Manufacture of Hose and Flexible Tubes.—H. A. Alden, Fishkill, N. Y., assignor to The New York Rubber Company:

I claim the herein-described process or method of water-proofing hose by internal application under pressure of such liquid or semi-liquid india rubber, gutta percha, or other cementing substance or compound as that, by subsequent exposure to air or heat or by being otherwise treated, shall form a dry flexible coating impervious to water, and when so water-proofed, I claim the mode described of preserving the cylindrical form for the hose.

37,193.—Rifled Muzzle for Smooth-bored Guns.—C. R. Alsop, Middletown, Conn., assignor to J. W. Alsop, of New York City:

I claim a rifled muzzle in combination with a smooth-bore gun barrel, substantially in the manner and for the purpose set forth

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37,194.—Ship's Windlass.—James Emerson, Manchester, N. H., assignor to Wm. P. Hunt, Dorchester, Mass.:

I claim, first, placing the two grabs, E E, on one vertical shaft and causing them to revolve in reverse directions for the purpose of heaving in the two chains of a ship at the same time, substantially as described.

Second, I claim the arrangement of the small gears, I J K L, and the clutch, N, in connection with the two chain grabs on the vertical shaft, P, for the purpose described. when arranged substantially as described.

Third, I claim the separation of the shaft, Q, thus making it in two pieces in order to allow nearly all of the working parts to be secured to the lower piece, for the purpose named and substantially as described.

37,195.—Hydraulic Cylinder.—Daniel Fitzgerald, New York City, assignor to himself and C. B. Tatham, Brooklyn, N. Y.:

I claim consolidating and combining the strength of concentric cylinders by means of water or other liquid, hot or cold, filling the interstices in the manner substantially as above described.

67,196.—Method of Securing Bits in Stocks.—Daniel Kelly (assignor to himself and J. A. Smith), Grand Rapids, Mich.:

I claim the arrangement of the notched wedge-faced pivoted button, a, with the tool stock, A, and tool, B, in the manner and for the purpose herein shown and described.

[The object of this invention is to obtain a simple device for securing bits to their stocks which may be readily applied to an ordinary round or square stock and which will draw the bit head firmly into the stock and at the same time lock it securely therein.]

37,197.—Coal Oil Lamp.—D. E. Hall, Brooklyn, N. Y., assignor to himself, Vasconcellos Houghton, Wm. A. Nichols and T. C. Sears:

I claim the fibrous mineral tip, i, prepared substantially as specified in combination with the wick, f, of fibrous material, as set forth.

I also claim the adjustable wick tube, d, in combination with the deflecting tube, g, for the purposes and as specified,

37,198.—Smelting Ores of Gold, Silver, Copper, &c.—William Quann, Philadelphia, Pa., assignor to himself, Wm. L. Taylor, A. R. Wetmore and C. C. Lathrop:

I claim in the process of smelting gold, silver, copper, nickel, and all other ores except iron, and for purifying the metal obtained therefrom, the use of wood ashes, chemical charcoal, carbonate of ammonia, oil or other resinous matter, salt, bone dust, sulphur and sand, substantially as described.

37,199.—Counting Attachment for Envelope Machines.—G. H. Reay, Hudson, N. J., assignor through mesne assignment to J. Q. Preble, New York City:

I claim so disposing the envelopes as the same are discharged from an envelope machine that one or more envelopes are pushed out beyond the edge of the regular pile at intervals of twenty-four or any other desired number of envelopes, substantially as and for the purpose herein shown and described.

[The invention consists in so disposing the envelopes, as they are discharged from an envelope machine, that one or more envelopes are pushed out beyond the edge of the regular pile at intervals of twenty-four or any other desired number of envelopes, and by these means the whole pile is divided off so that the envelopes can be taken out without counting and made up into packs of the desired number.]

37,200.—Concussion Fuse for Shells.—S. R. Russell, Middletown, Ohio, assignor to himself and B. F. Tefft, Bangor, Maine:

I claim the combination with a projectile of the perforated tube, B, the plunger, D, plug, H, and fuse, C, arranged and operated in the manner and for the purposes substantially as herein described.

37,201.—Machine for Screwing on the Soles and Heels of Boots and Shoes.—Eugene Lemercier, Paris, France, administrator of the estate of L. J. Sellier, assignor to A. B. Howe, New York City:

I claim, first, constructing and mounting the machine in such a manner that any required pressure may be produced on the shoe at the will of the operator while the screw is entering the sole and instantly stopped after the point of the screw touches the iron last, substantially as and for the purpose described.

Second, In combination with a machine for cutting and inserting screws in boots and shoes, an elevating and depressing apparatus, as shown at F G H, Fig. 1, by means of which the machine can be elevated or depressed as required, as in passing from the heel to the shank of the shoe, which apparatus also admits of placing the machine in such a position that the screw may enter the sole at any required longitudinal angle, substantially as described.

Third, Connecting the machine to the depressing lever, D, as shown at I'' I'' I''' I I', for the purpose of inclining the machine to the right or left, so that the screw may be entered at any required lateral inclination.

Fourth, In combination, the elevating and depressing apparatus, F G H, with the connecting joint, I'' I'' I''' I I', for the purposes set forth in the specification.

Fifth, In combination with the screw, R, and spring, V, the movable step or bisected nut, v v', for feeding in a fresh supply of wire and acting in the manner described and for the purposes set forth.

Sixth, The nose with recesses, h h', Fig. 3, acting as a gage for insuring a uniform distance between the screws.

Seventh, In combination with a machine that makes and supplies screws from a continuous wire, the cutter, d, actuated by a lever, N, rack, e, pinion, O, and a spring, f, said cutter severing the screw near the sole, as soon as screwed home.

Eighth, the triangular section of the cutter, d, shown at Fig. 2 2a and 3, leaving the lower ends of the screw in the shape of an inverted V, for the purpose of spreading and riveting on the last.

37,202.—Sewing Machine.—A. B. Shaw (assignor to himself and N. H. Shaw), Worcester, Mass.:

I claim the combination of the lifting cam and pin, x, with the lever, H, and springs, u v, in the manner and for the purpose shown and described.

[A part of this invention relates to the use of an eye-pointed looper operating in combination with an eye-pointed perforating needle to produce what is known as the double-looped stitch and it consists in a certain mode of applying and giving motion to such looper by which the machine is enabled to be simply and cheaply constructed and made very effective and certain in its operation. Another part of the invention relates to what is known as the top feed, in which the presser and feeder are combined in one foot-piece working on the loop of he cloth, and it consists in a certain mode of relieving the said foot-piece of pressure while it is returning to take a new hold of the cloth after every feeding movement.]

37,203.—Knapsack.—Joseph Short, of Boston, Mass., assignor to Abbie H. Short, of Salem, Mass.:

First, I claim the suspension strap or straps, c', in combination with the connecting strap or straps, i, and yoke or neck-strap, B, in the manner and for the purpose substantially as set forth.

Second, I claim the steady pins, e e, in combination with the knapsack, A, substantially in the manner and for the purpose set forth.

37,204.—Grate for Stoves.—Isaac Smith (assignor to S. H. Ransom & Co.), of Albany, N. Y.:

I claim combining with the grate, suspended by hinges as herein referred to, the dumping arrangement, substantially as described.

37,205.—Bending Metallic Spouts.—E. Valentine & M. Ridout (assignor to himself and William Beck), of Milwaukie, Wis.:

We claim the use of an elastic core or mandrel in the manufacture of curved metallic pipes or spouts, substantially in the manner hereinbefore set forth.

We also claim the use of a series of thin elastic metallic plates in the construction of a core or mandrel for the inflection of metallic spouts, substantially in the manner herein set forth.

When an elastic core or mandrel is used in the manufacture of curved metallic spouts, we claim the use of a shaping block, G, a retaining hook, S, and a lever-actuated swaging wheel, T, or their equivalents, when combined and arranged substantially in the manner and for the purpose herein set forth.

When a lever-actuated swaging wheel, T, and shaping block, G, are used in the inflection of metallic spouts, we claim the use of an elastic projecting band, p, and elastic cushion, r, or their equivalents, when combined and arranged substantially in the manner and for the purpose herein set forth.

37,206.—Machine for Rolling Tires for Locomotive Wheels.—Sherman Jaqua, of Paterson, N. J.:

I claim, first, The arrangement, as described, of the top and bottom rollers in an adjustable frame, which is so constructed and attached to the bed as to allow the axis of the said rollers to be brought into a radial line with tires of various sizes, while, at the same time, they are made capable of inward and outward radial adjustment, substantially as set forth.

Second, The arrangement of two bottom rollers, as herein described, in relation to the top roller, by which the tire is prevented from sagging away from the top roller, and a finishing flange roller allowed to be placed immediately under the top roller, as herein set forth.

Third, The arrangement of the bottom rollers for finishing the lower edge of the tire, in a different radial plane from that which is occupied by the driving rollers, by which they are prevented from interfering with the said driving rollers, and a more efficient and satisfactory arrangement of parts is made admissable.

37,207.—Military Observatory.—Thomas Welham, Nemaha county, Nebraska:

I claim the combination of an observatory, look-out or signal station in such a manner that it can be elevated, when desired, to any required and practicable hight by the addition of successive lengths or sections to the lower end of its supporting shaft, substantially in the manner described.

37,208.—Breech-loading Fire-arm.—Samuel Strong, Washington, D. C.:

I claim mounting the hammer upon and securing it to the hinged gate and notching the face of the hammer at such a point relative to the trigger, that in the act of closing the gate to its seat in the breech, the trigger will enter the notch and raise the face of the hammer off the cartridge, as described.

Also, in dividing the handle of the gate by which it is operated, or securing to its lower surface a spring catch, w, which takes into a notch formed in the breech, in the manner set forth.

And the combination and arrangement of the gate, hammer, trigger, and mainspring, independent and so constructed that unless the gate is fully closed the hammer cannot be raised to full cock nor the piece discharged in any other position.

RE-ISSUES.

1,363.—Machine for sewing Soles to Boots and Shoes.—Henry Dunham, Jr., Abington, Mass. Patented September 9, 1862:

I claim the combination of the curved and hooked needle with the last, constructed with a concave bottom, the whole being substantially as described and represented.

I also claim the arrangement of the hook on the flank of the curve of the shank of the needle, as described, and with respect to the awl, so as to juncture lengthwise instead of crosswise of its section, a hole as made by the awl.

I also claim the combination of an awl curved longitudinally with a needle, having its shank curved longitudinally and provided with a hook near its point.

I also claim as an improvement a sewing machine, as constructed not only with its needle curved and hooked, but with the same and the rest cast off and needle-closer made to operate in curved paths, having a common center or axis, as described.

I also claim the combination of the curved and hooked needle with the last, constructed with a concave bottom and with a chamfer, or with their mechanical equivalents, so as to form a ridge around the said bottom and inside of its outer edge, as specified.

I also claim the combination of the last holder with its carrying plate, in such manner as to enable the former, to be inclined with respect to the latter, substantially in manner as set forth.

I also claim the above-described arrangement of the feeding mechanism with respect to the last carrying-plate supporter, M, and the sewing mechanism.

I also claim a curved awl and a curved hook needle, arranged and combined with a guide wheel, G, and a last having a concave bottom, the whole being in manner substantially as specified.

1,364.—Metallic Car for Railroads.—La Mothe Life-preserving Iron Car Co. (assignees of B. J. La Mothe), New York City. Patented Sept. 24, 1861:

I claim, first, The construction of the frames of railroad cars and other vehicles, of tubes or of tubes and bars combined, substantially in the manner described.

Second, Connecting the separate tubes of which the ribs are composed, and strengthening the corners by inserting the tubes within each other or by the insertion of additional tubes or rods, as specified.

Third, Clamping the intersections by means of the sleeve sockets, i, fitting loosely over the bars or tubes, midway between the ribs, driving tightly against them.

Fourth, The pair of riveted or bolted clamps, h, Figs. 6 and 7, securing the intersecting bars or tubes without perforating the latter with holes.

1,365.—Grate for Stoves.—S. H. Ransom & Co. (assignees of Isaac Smith), Albany, N. Y. Patented Nov. 27, 1860:

I claim suspending the grate by cranes or hinges, substantially as set forth.

1,366.—Grain and Seed Winnower.—George Westinghouse, Schenectady, N. Y. Patented March 4, 1862:

I claim the combination of the swinging shoe, H, operating as described, with the fan, C, when the blast of the latter operates upon the former in the manner and for the purpose specified.

EXTENSION.

5,966.—Scoop and Elevator.—Ephraim Morris, New York City. Extended Nov. 26, 1862:

I claim the application of the two-part scoop, g g, at the lower end of the frame, a a, conjointly with the arrangement described and shown, by which the toggle-joint arms, h h h h, close the scoops to load, when acted on by the rope or chain, 10, which afterward raises the scoops and load, and through which arrangement the same parts open the scoop to discharge the load, when acted on the toggle-joint arms, through the shafts, b and e, and drums, c c and d, substantially in the manner hereinbefore described and shown.

DESIGNS.

1,695.—Pattern of Floor-cloth, &c.—David Foyer, Dover, N. H., assignor to Abraham Folsom & Son, Boston, Mass.

1,696.—Stove Plate.—Julius Hobzer (assignor to E. M. Manigle), of Philadelphia, Pa.

1,697.—Stove.—J. D. Marshbank (assignor to himself and William McConkey), of Lancaster, Pa.

1,698, 1,699, 1,700.—Carpet Patterns.—E. J. Ney (assignor to the Lowell Manufacturing Company), of Lowell Mass.

1,701.—Military Hat.—W. F. Warburton, Philadelphia, Pa.

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The law abolishes discrimination in fees required of foreigners, excepting reference to such countries as discriminate against citizens of the United States—thus allowing Austrian, French, Belgian, English, Russian, Spanish and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN; and as an evidence of the confidence reposed in ou Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submitit to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

Preliminary Examinations at the Patent Office.

The service we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. More than 5,000 such examinations have been made through this office during the past three years. Address MUNN & CO., No. 37 Park-row, N. Y.

How to Make an Application for a Patent.

Every applicant for a Patent must furnish a model of his invention if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fees by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & Co., No. 37 Park-row, New York.

Foreign Patents.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our Branch Offices.

Rejected Applications.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, docu

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ments, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief story of the case, inclosing the official letters, &c.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the tent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats, in English and German, furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

Notes and Queries

J. W. R., of Ill.—There is no good work published on milling and millwrighting according to American practice. There is a great variety of opinion among millers respecting the best dress and the speed of stones. We advise you to visit some of the best mills and examine all the machinery. The information you would thus acquire would be of immense benefit to you.

C. H., of N. Y.—Jordan almonds are the bitter almonds which are natives of Syria. The common bitter almonds will answer your purpose in making cosmetics.

W. R. B., of N. H.—We have no data at handrfom which we can give you reliable figures for the frictional grooved wheels in question. The dimensions in question will be readily supplied by the makers of such machinery—the Novelty works in this city.

J. F., of Wis.—Wm. Gates, of Frankfort, N. Y., is a reliable manufacturer of friction matches. We cannot answer your other inquiries satisfactorily; there is no accounting for the whims and conceits of men. $1 received for four months' subscription.

L. V. R., of N. Y.—You can obtain pistol saving metallic cartridges of J. W. Storrs, No. 256 Broadway, this city.

J. E., of C. W.—We do not think you could employ any method, practically valuable, more advantageously than your present one. There are several methods of making carbonic acid gas known to science, but the quality most suitable for your use is made by sulphuric acid and marble dust.

W. M., of N. Y.—We do not care to discuss the currency question at any length in our columns. We devote but little space to such subjects and therefore must decline your article. We do not undertake to preserve contributions sent to us for publication. Parties should keep copies if they wish to preserve their papers.

J. W. M., of N. Y.—There are certain kinds of powder on sale at druggists, which are good to drive away roaches. Get something of this kind and use it thoroughly and you may succeed in getting rid of the pest. We know of nothing better.

L. L., of Pa.—Your suggestion to divide postage-stamps in the center by a series of holes so as to allow one half the stamp to be torn off is a good one, but it is not new. The same thing has been suggested to us before.

R. V. DeW., of N. Y.; L. K., of Ohio., and several others.—Your interesting communications have been received and will appear as soon as possible.

A. W., of Mass.—The Ruhmkorff coil is the most powerful electrical apparatus for decomposing water. Mr. Ritchie, of Boston, manufactures a superior apparatus of this character.

H. A. G., of Mo.—If you wish to become an engineer you must serve an apprenticeship until you are twenty-one years of age. Apply to any steam-engine builder, and if he wants your services he will give you the conditions under which you will be accepted.

J. B., of Cal.—It affords us pleasure to know that the chemical information published in our columns has been the source of so much pleasure and profit to you. The aniline colors which have so interested you may be those which are eliminated in nature's laboratory in embellishing the flowers of the field, but man knows very little about the forces which govern the functions of plants in secreting their colors.

H. S., of Ill.—You could undoubtedly boil the liquid at a much lower pressure of steam by increasing the amount of radial surface through which it passes; precisely how much less would depend wholly upon the increased radiation. You will not experience any difficulty, we think, from the cause you apprehend, unless you wire-draw the steam by crowding it through narrow tubes; none less in diameter than ¾ths of an inch should be used. These are the size of those which are inserted in the condensers of our ocean steamers.

D. C. S., of Iowa.—Magnesium wire cannot be obtained here.

D. S., of Wis.—Smee's work on electro-metallurgy is published by J. Wiley, of this city. Napier's work on the same subject is of more recent date. It is an English publication. We do not know its price. Electro-plating, if well executed, and a good thick coating put on, is said to be as permanent as fire-plating for carriage irons. We have not heard of any experiments being made however, to test the comparative durability of the two systems.

D. S., of N. Y.—Every speck of mold or mildew upon a sail or other cloth injures the cloth beyond recovery, because the mildew is really a decay of the fabric caused by fungi. Every spot of mildew should be brushed off the moment it is noticed. Fungi or mildew generally appears when sail-cloth is reefed or folded up damp.

A. P. T., of Mass.—The information which we can give you respecting the preparation of dry collodion-paper for artists has been published in our columns. Many artists state that they have never seen good pictures produced with dry sheets.

M. & S., of Pa.—Light iron patterns can easily be coated with wax, but shellac varnish is the best that can be applied to wooden patterns. The shellac is dissolved in alcohol, and three coats of varnish should be put on. We have been informed that a coating of bees' wax mixed with turpentine is easily applied and is excellent for both iron and wood patterns as a priming for a second coating with shellac varnish.

G. B. F., of Conn.—The fiber of the milk-weed is beautiful and silky, but it appears to be too weak even for the manufacture of paper. Some experiments however, should be made to test its capabilities for this object. Your torpedo is original so far as it relates to its mode of propulsion by rockets, but we think it would be difficult to control. Thus far submarine torpedoes have, in most instances, proved failures.

D. W. W., of N. Y.—We are not in possession of practical information received from any of our correspondents as to the relative merits of the diamond and the steel pick in dressing millstones. Most all our correspondents who are millers use the steel pick.

A. M., of Wis.—Parallel shafts generally run easier when connected with small than large cog gearing. We would prefer a wheel of one foot in diameter to one three feet, when the distance between the shafts is of no consequence and the speed of the shafts is equal.

C. C., of D. C.—The chloride of calcium and the chloride of lime are two very different things. You have been using the latter to make artificial stones and no wonder you failed. The chloride of calcium is made with hydrocloric acid (muriatic) and chalk, or carbonate of lime. The common chloride of lime is made with hydrate of lime and chlorine gas. Harding's process for making the silicate of soda is patented.

T. S. S., of Va.—It has been proposed to us several times to arm gunboats with a submarine gun on the bow of each, which is a more plausible application than furnishing them with a percussion shell each, because the submarine gun embraces a mode of loading and firing under water. The muzzle of the submarine gun was also to be used as a ram.

Money Received

At the Scientific American Office on account of Patent Office business, from Wednesday, December 17, to Wednesday, December 24, 1862:—

W. H. W., of R. I., $25; A. H. E., of N.Y., $150; P. & G., of N.Y., $30; C. D., of Min., $30; H. L. C., of N. Y., $15 T. N. D., of Ind., $20; M. R. S., of N. Y., $45; T. D. L., of N. H., $25; J. C. C., of Pa., $25; J. W. L., of N. Y., $22; D. I. S., of N. Y., $15; G. F. J. C., of N. J., $35; W. H. F., of Mass., $20; L. S., of N. Y., $25; J. A. L., of N. Y., $45; J. E. S., of Me., $20; S. W., of N. Y., $20; A. M., of N. Y., $12; W. J. D., of N. Y., $25; E. B., of N. Y., $15; A. B. H., of Pa., $35; S. L., of O., $10; S. T. S., of Mass., $15; J. B. McC., of Mo., $40; W. T. M., of Ill., $25; S. W., of Mass., $30; R. B., of Cal., $30; F. B., of Conn., $45; A. L., of N. Y., $20; G. J., of N. Y., $20; J. A., of Pa., $45; C. W. P., of N. Y., $20; W. H. S., of N. Y., $15; J. T. B., of Ill., F. D. D., of O., $20; T. W. B., of N. J., $25; A. S. L., of N. Y., $136; L. O. C., of Pa., $30; C. C. W., of Pa., $25; W. F. G., of Pa., $25; G. W. F., of N. Y., $15; C. B., of Me., $25; L. C., of Mass., 15; J. H., of Iowa, $15; P. & C., of N. Y., $25; A. C., of N. B., $40; A. M., of N. Y., $22; P. McG., of Iowa, $20; W. R. G., of N. Y., $20; H. B. F., of N. Y., $15; W. P., of N. Y., $35; H. H. S., of N. Y., $20.

Persons having remitted money to this office will please to examine the above list to see that their initials appear in it, and if they have not received an acknowledgment by mail, and their initials are not to be found in this list, they will please notify us immediately, and inform us the amount, and how it was sent, whether by mail or express.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from December 17, to Wednesday, December 24, 1862:—

P. & C., of N. Y.; J.W. L., of N. Y.; A. M., of N. Y.; W. H. W., of R. I.; G. F. J. C., of N. J.; A. B. H., of Pa.; W. J. D., of N. Y.; W. F. G., of Pa.; C. C. W., of Pa.; E. J. M., of N. Y.; F. C. G. H., of N Y.; W. T. M., of Ill.; H. F., of O.; C. D., of Min.; A. H. C., of N. Y. L. S., of N. Y.

TO OUR READERS.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona fide* acknowledgment of our reception of their funds.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on design patents when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

NEW PAMPHLETS IN GERMAN.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application at this office. Address MUNN & CO.,
No. 37 Park-row, New York.

Binding the "Scientific American."

It is important that all works of reference should be well bound. The SCIENTIFIC AMERICAN being the only publication in the country which records the doings of the United States Patent Office, it is preserved by a large class of its patrons, lawyers and others, for reference ome complaints have been made that our past mode of binding in cloth is not serviceable, and a wish has been expressed that we would adopt the style of binding used on the old series, *i. e.*, heavy board sides, covered with marble paper and morocco backs and corners.

Believing that the latter style of binding will better please a large portion of our readers, we shall commence on the expiration of this present volume to bind the sheets sent to us for the purpose in heavy board sides, covered with marble paper and leather backs and corners.

The price of binding in the above style will be 75 cents. We shall be unable hereafter to furnish covers to the trade, but will be happy to receive orders for binding at the publication office, 37 Park Row New York.

RATES OF ADVERTISING.

Twenty-five Cents per line for each and every insertion, payble in advance. To enable all to understand how to compute the amount they must send in when they wish advertisements inserted, we will explain that ten words average one line. Engravings will not be admitted into our advertising columns; and, as heretofore, the publishers reserve to themselves the right to reject any advertisement they may deem objectionable.

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INVENTORS AND CONSTRUCTORS OF NEW AND useful Contrivances or Machines, of whatever kind, can have their Inventions illustrated and described in the columns of the SCIENTIFIC AMERICAN on payment of a reasonable charge for the engraving.

No charge is made for the publication, and the cuts are furnished to the party for whom they are executed as soon as they have been used. We wish it understood, however, that no secondhand or poor engravings, such as patentees often get executed by inexperienced artists for printing circulars and handbills from, can be admitted into these pages. We also reserve the right to accept or reject such subjects as are presented for publication. And it is not our desire to receive orders for engraving and publishing any but good Inventions or Machines, and such as do not meet our approbation in this respect, we shall decline to publish.

For further particulars, address—

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GREAT INTERNATIONAL AGRICULTURAL EXhibition at Hamburg, Germany, of 1863. To Inventors and Manufacturers of Agricultural Implements and Machinery. This exhibition, which is to open on June 1, 1863, will be the first opportunity offered to American Inventors and Manufacturers to bring to the immediate notice of the people of Northern and Central Europe, the great improvements of this country in Agricultural Implements and Machinery, and such other important inventions pertaining to domestic economy and other various occupations of industry. Mr. James R. McDonald, Ex United States Consul, and for many years a resident of Hamburg, has been selected as one of the Directors of this Exhibition, with a view of securing to American Exhibitors a proper interest in their contributions, and to attend to their sale if required. Immediate application should be made for proper accomodation to AUSTIN BALDWIN & CO., No. 72 Broadway, New York. 25 3

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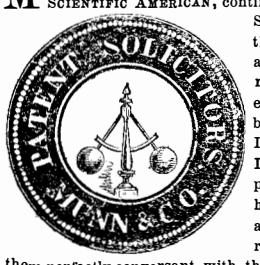

Consultation may be had with the firm between NINE and FOUR o'clock, daily, at their PRINCIPAL OFFICE, No. 37 PARK ROW, NEW YORK. We have also established a BRANCH OFFICE in the CITY OF WASHINGTON, on the CORNER OF F AND SEVENTH STREETS, opposite the United States Patent Office. This office is under the general superintendence of one of the firm, and is in daily communication with the Principal Office in New York, and personal attention will be given a the Patent Office to all such cases as may require it. Inventors and others who may visit Washington, having business at the Patent Offices are cordially invited to call at their office.

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Improved Steam-boiler Furnace.

The improvements in the steam-generating qualities of boilers are of great importance, and we present illustrations of a plan for effecting the object, which has been lately patented. The advantages of this method are, increased amounts of heating surfaces without enlarging the size of the boiler; and the invention consists in the combination for the grate of a boiler furnace, of a series of elliptical tubes, or those of a similar form with others of a like shape placed around the sides of the firebox. Fig. 1 in our engraving is a perspective view of the firebox, with the crown sheet removed so as to expose the interior. The seven bars or tubes, A, are those through which the water circulates, and to which the action of the fire is applied. Above these may be seen a long round tube, B, having seven other oval pipes, C, in communication with it. The square bolt heads

Fig. 1

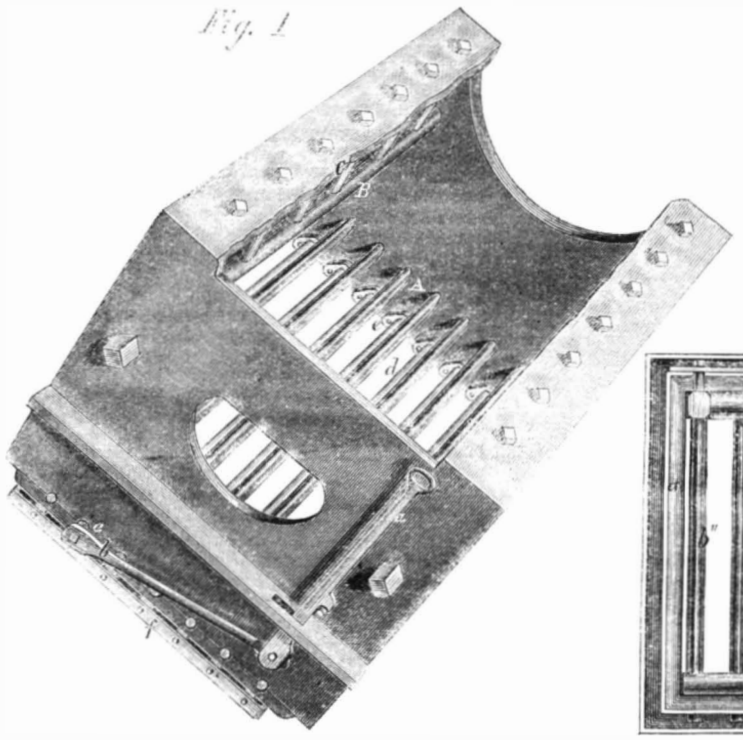
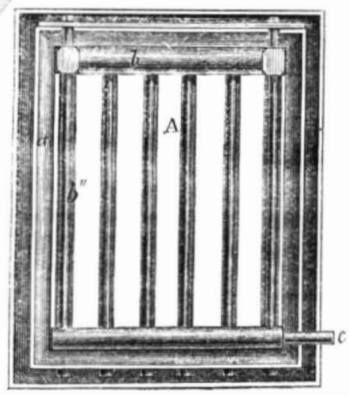


Fig. 2



EVANS'S PATENT STEAM-BOILER FURNACE.

rojecti ng are merely those which close up the apertures left for getting at the work. Upon the front end of the furnace there is an apparatus attached for clearing the grates of loose ashes and cinders, thus maintaining at all times a clear fire. An upright handle, *a*, is jointed at its lower end to a long lever, *b*, this lever is fastened at the other extremity to a shaft, *c*, which is fixed to the gang of seven grate bars, *d*, beneath the elliptical tubes, A, through the agency of seven cranks, *e*, these latter are all connected by the bar, *f*, at the bottom of the firebox, so that a vertical motion of the handle, *a*, operates the whole set. The inventor states that this will be found convenient for the purpose previously set forth.

Fig. 2 represents the lower part of the grate, *a*, which is of cast-iron, riveted to the boiler plates, and the arrangement of the feed pipes, respectively *b* and *b''*, also the elliptical tubes, A, which are in the fire. The feed pipe of the pump is attached at *c*, and the water then circulates through the tubes just mentioned. A perfect distribution of the feed is thus insured to all parts, it passing as well through the elliptical pipes, C, in Fig. 1. The edges of the casting, *a*, are beveled inwardly so as to permit the ashes to deposit themselves around the feed pipes, and protect them from injury. It will be seen from the exposure of these combined tubes to the direct action of the fire, that a large amount of evaporating surface is produced. The lower tubes, A, in Fig. 1, are at all times surrounded by incandescent fuel, and the smaller pipes, through which the feed water is injected, also insure its delivery in a state of or approaching ebullition. These pipes, tubes and castings may, if desired, be tested before applying or riveting them in place.

The patent for this invention was procured through the Scientific American Patent Agency, April 6, 1862, and further information in relation to it may be obtained by addressing the inventor, Joseph P. Evans, of Hazleton, Luzerne county, Pa.

Manufacture of Copal Varnish.

M. H. Violette, a French chemist, has been making important investigations respecting the nature of copal gum and the manufacture of copal varnish. He states that there are three principal varieties of copal used in the arts. They consist of hard, semi-hard and soft copal. The best hard comes from Calcutta and the semi-hard from Africa; these two varieties only are employed in making oil varnish, the soft copal is used for making varnish for indoor work. Although copal is vulgarly called a gum, it is really a resin, in being insoluble in water. These resins exude in a fluid state from trees, and harden on the outside in lumps. The solvents employed for gum copal are a mixture of oil and turpentine, and yet these will not dissolve the resin cold or in a natural state. The method employed to dissolve the copal is to fuse or distil it first in an iron vessel, then add hot linseed oil and turpentine. In this process the hard copal is first decomposed by heat, otherwise it will not dissolve. This resin becomes dark in the color just in proportion to the temperature to which it is subjected. Hard copal fuses at 340° Fah., and distils at 360°; semi-hard fuses at 180° and distils at 230°, and neither will dissolve in common turpentine merely melted. M. Violette states that these copals only become soluble in a mixture of turpentine and oil, after losing 25 per cent of their weight by heating; and, in order to obtain the largest quantity of the best varnish from them, they should be distilled at a temperature not exceeding 360°. He also mentions a peculiar mode of dissolving the copal, when it has lost only about 10 per cent of its weight by fusion. The solvent in this case is turpentine which has become thick by prolonged exposure to light and air. The cause of this solvent power in turpentine, so treated, is unknown at present. Were it possible to impart this quality to turpentine by a short and easy process, a great improvement in the art of manufacturing such varnish would be effected. M. Violette asserts that the art of making copal varnish has made no progress in several hundred years, and chemists and manufacturers are exhorted to devote attention to this subject, as this is the most important of all varnishes for woodwork that is subjected to out-door exposure.

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Now that such urgent calls are being made by those interested in supplying stock for the manufacture of paper, including old papers of every description, there is great danger that it will lead to the destruction of much valuable matter which cannot be replaced. A gentleman residing in Woodstock, N.H., who has been so thoughtful as to remind us of the spoliation in progress in the midst of the fever created by the paper famine, says in a private note that he recently found in the shop of a buyer of that place many newspapers of from 20 to 50 years of age, old pamphlets, registrers, &c., &c., with a curious old music-book published in 1771, containing memorandum notes relating to the Revolutionary war, written therein. Some means should be devised to rescue from such wholesale destruction whatever may be found to be of interest, in the hands of the collectors of paper material, and that immediately, or it will be too late, Much may and should be done by individuals in their own vicinity, especially by those who reside near paper-mills.

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FROM THE STEAM PRESS OF JOHN A GRAY

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